THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LV. No. 1393.] LONDON, JANUARY 21, 1890. [42ND YEAR. Price 6d.

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Guaranteed Free from Adulteration. **TORBAY PAINTS.**

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See Advertisement, p. 46.

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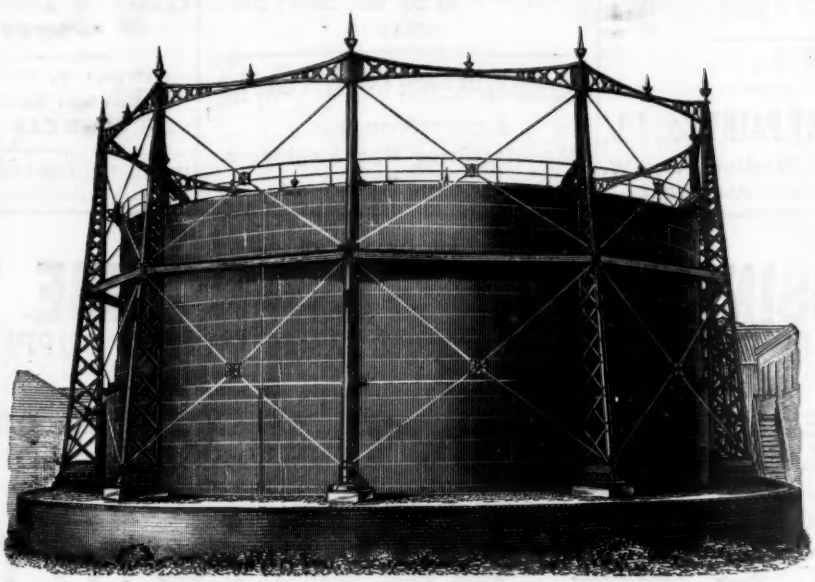

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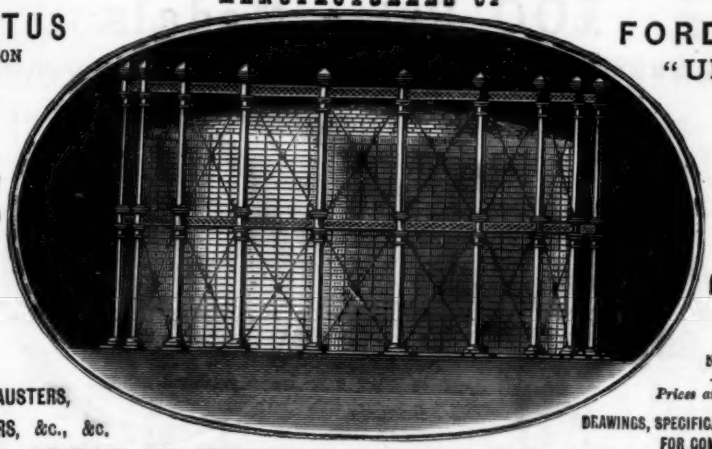

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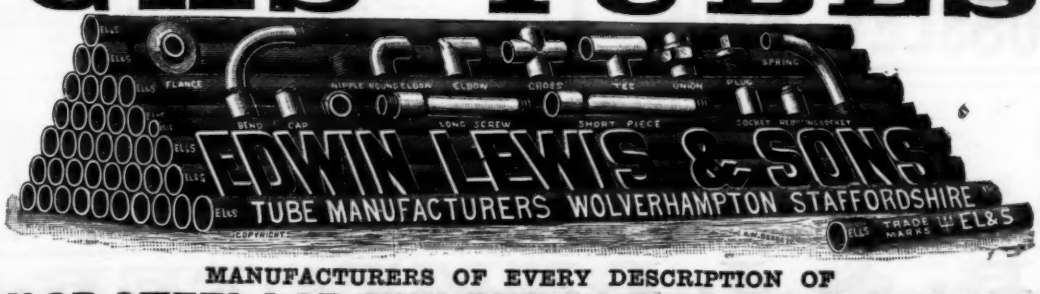

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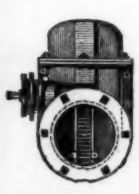

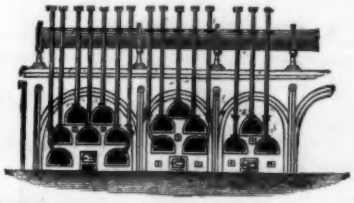

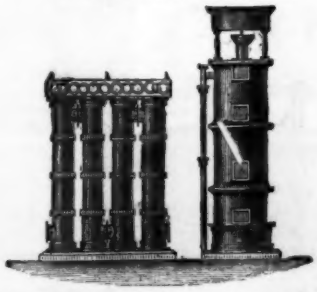

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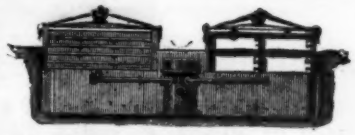

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100 Prize Medals.

MADE in SIZES
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GAS-ENGINES
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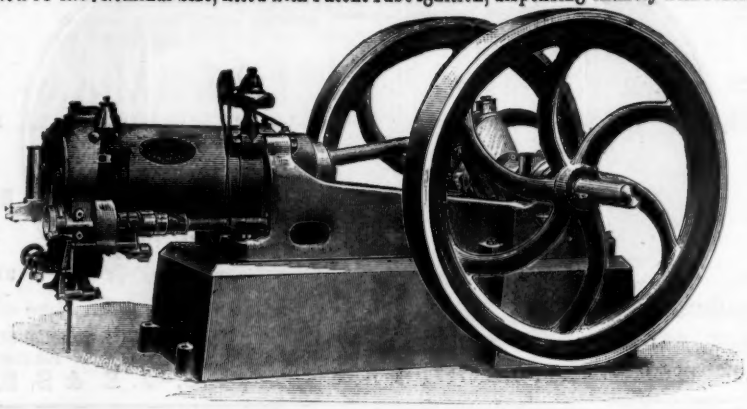
New 14-H.P. Nominal Size, fitted with Patent Tube Ignition, dispensing entirely with Plates.



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VERTICAL
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Largely used for
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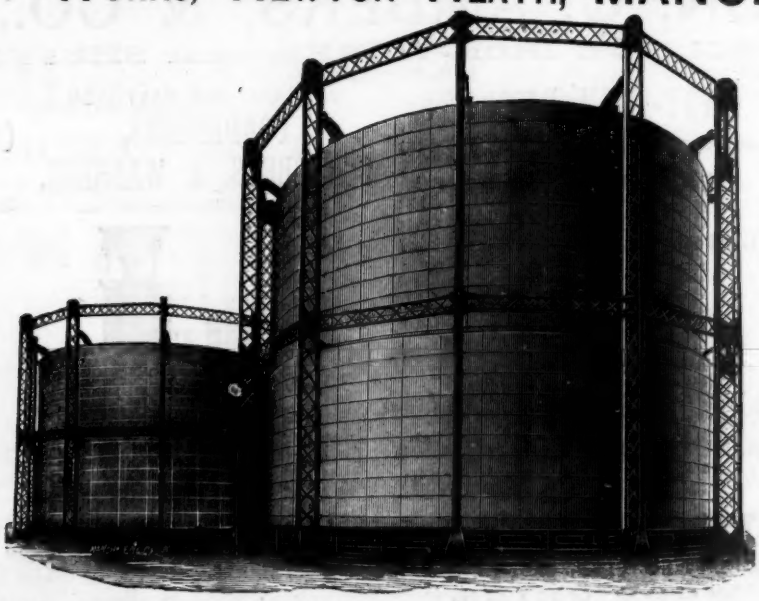

Illustration showing view of two Telescope Gasholders, each 65 feet diameter by 48 feet high, recently erected by Messrs. R. and J. Dempster, in Tanks previously occupied by Single-lift Holders 20 feet deep. The Tanks were made 4 feet deeper, by adding a Tier of Cast-Iron Plates, prepared with suitable Flanges, to meet the Brickwork of a Brick and Puddle Tank. The storeage capacity was thus increased nearly 150 per cent. at comparatively little outlay.

JOHN ABBOT & CO., LIMITED.

ESTABLISHED 100 YEARS.

THE LARGEST

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The present Low Prices render it absolutely necessary for Gas Engineers to use the commonest Pyrites Acid, and obtain the whitest and best quality of Sulphate, so as to obtain a better price and more ready market.

For this purpose they strongly recommend the

NEW IMPROVEMENTS

Combined with their

PATENT SAFETY CLOSED SATURATORS

AND

Improved Self-acting Steam Liming Process

Under pressure, effecting a considerable Saving in Time in Working off the Contents of each Still.

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A number of Plants on the Open System recently remodelled with greatly improved results.

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Messrs. ABBOT & Co. (Works at Gateshead-on-Tyne) employ 2000 men, including several experienced Plumbers, to erect New and remodel Old Sulphate Plants.

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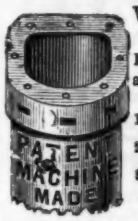

WORTLEY FIRE-CLAY WORKS,
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth Interior, preventing Adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

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MACHINE-MADE GAS-RETORTS.

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MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

A STOCK OF DIFFERENT SHAPES ON HAND.

RUSCOE'S PATENT MACHINE

FOR DRILLING AND TAPPING WATER-MAINS AND GAS-MAINS UNDER PRESSURE.

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Sole Maker of HELPS' PATENT PIPE EXTRACTOR.

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The undersigned, SOLE AGENTS for this celebrated Gas Cannel, now offer it for delivery at any port in

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This Cannel ranks with the Australian Shale as an enricher of Coal Gas; One Gross Ton producing

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OF ALL FORMS & SHAPES IN IRON OR STEEL BY SPECIAL HYDRAULIC MACHINERY.

PRICES ON APPLICATION.

"THE METEOR."

NEW HIGH-POWER GAS-LAMP,

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Gas Companies should hire these Lamps to their Consumers, and introduce them for Street Lighting as a rival to the Electric Light, as they do not get out of order, are most economical, and the Burner being a circular slit does not choke up.

Particulars and Prices Free.

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By Her Majesty's Royal Letters Patent.

DR. FELDMANN'S APPARATUS

The most successful and approved Apparatus known up to the present time.

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Retort-Fittings, Condensers, Scrubbers, Purifiers, Gasholders, &c.

Morris & Cutler's Patent "Perfect" Condenser places the temperature of the Gas completely under the Engineer's control.

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"Standard" Washer-Scrubber,

As supplied to and in course of construction for—

The Gaslight and Coke Company—	Liverpool United Gas Company.	John Brown & Co., Ltd., Sheffield.
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Thoroughly extracts every grain of Ammonia and a large quantity of other Impurities from Gas.

Has been for many months in successful and satisfactory operation at **The Gaslight and Coke Company's Station at BECKTON** (*vide* Testimonial).

The Gaslight and Coke Company, Horseferry Road, Westminster, S.W.,
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Messrs. KIRKHAM, HULETT, AND CHANDLER, LTD.,

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I am, yours truly, (Signed) G. C. TREWBY.

1. The weight in motion is **only one-seventh** of that in the present Machine.
2. It requires **only one-seventh** the power to drive; consequently effecting a large reduction in cost of Engine as well as in steam power.
3. **The Wear and Tear is enormously reduced,** as the Shaft has comparatively little weight to carry.
4. It has been found that the washing surfaces **keep perfectly clean** and free from deposit from end to end of the Machine.
5. It is so constructed that it forms a most powerful, effective, and complete system of purification, gives no pressure, and can be removed and replaced without trouble or injury.
6. The "New Standard," owing to the foregoing, can be supplied at **a large reduction in price.**

Engineers desirous of working Ammoniacal Liquor over and over again prior to leaving the "New Standard" can do so by the automatic and simple arrangement which forms part of this Patent.

The Apparatus can be applied to "Standard" Washer-Scrubbers already in use.

THE "STANDARD" TAR, H_2S, & CO_2, EXTRACTOR.

This Apparatus has been in operation some considerable period at the **Avon Street Station of the Bristol United Gas Company,** where it has been thoroughly tested, and found to give entire satisfaction. Drawings and particulars on application. (*Address as above.*)

TESTIMONIAL.

Bristol United Gaslight Company, Avon Street Station,
Dec. 2, 1889.

Messrs. KIRKHAM, HULETT, AND CHANDLER, LTD.,

GENTLEMEN,—In reply to your enquiry as to the efficiency of the "Standard" Tar and Impurity Extractor fixed at this Station, I have pleasure in informing you that, ever since the apparatus has been at work, it has given entire satisfaction, as it removes every particle of Tar, nearly the whole of the NH_3, and a large proportion of H_2S and CO_2, the additional back pressure being only one inch.

I am, Gentlemen, yours truly,

(Signed) E. J. LLOYD.

R. LAIDLAW & SON,

GAS AND WATER ENGINEERS.

Manufacturers of **GAS APPARATUS** of every Description.

Makers in GLASGOW of

CAST-IRON PIPES, ALL SIZES,
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STEAM-ENGINES AND BOILERS,
PUMPING ENGINES FOR WATER-WORKS,
BEALE'S GAS EXHAUSTERS,
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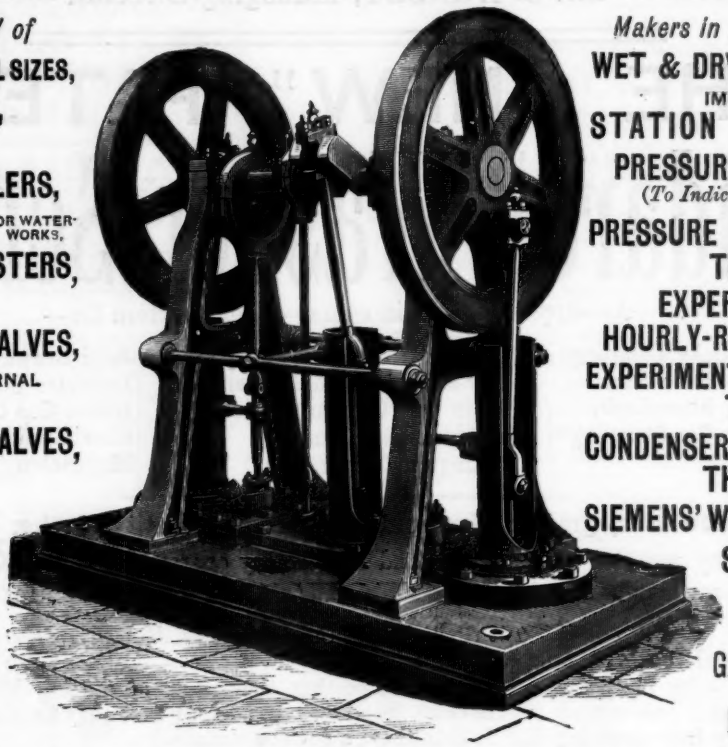
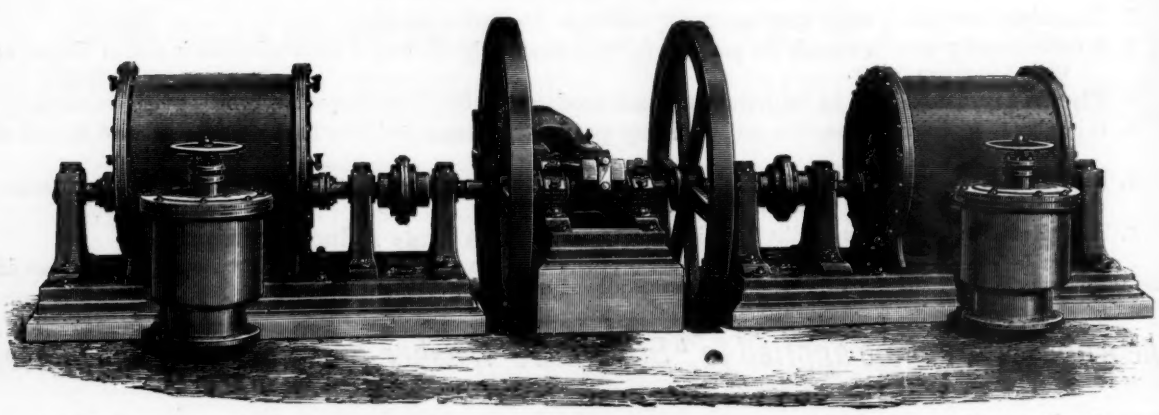
CAST-IRON COLUMNS,
BEAMS, GIRDERS, AND WATER-TANKS,
WROUGHT-IRON TUBES, FITTINGS, &c.



Makers in EDINBURGH of

WET & DRY GAS-METERS,
IMPROVED STATION GOVERNORS,
PRESSURE REGISTERS (*To Indicate New Time*),
PRESSURE GAUGES,
TEST HOLDERS,
EXPERIMENTAL HOURLY-RATE METERS,
EXPERIMENTAL TEST METERS,
CONDENSER THERMOMETERS,
SIEMENS' WATER-METERS,
STREET LANTERNS,
And all Kinds of GAS APPARATUS AND FITTINGS, &c.

PUMPING GAS EXHAUSTER AND ENGINE COMBINED. All Sizes.



BEALE'S GAS EXHAUSTERS AND ENGINE COMBINED. All Sizes.

Prices, with full Particulars, will be given on application.

Two Gold Medals, One Silver Medal, One Bronze Medal, and Two Honourable Mentions,
INTERNATIONAL EXHIBITION, EDINBURGH, 1886.

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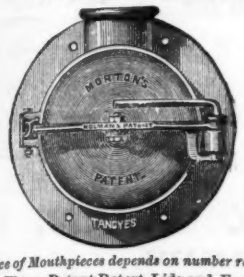
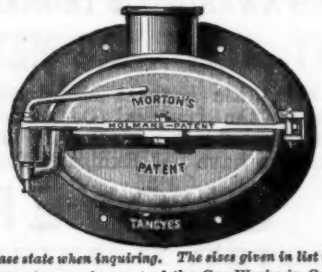
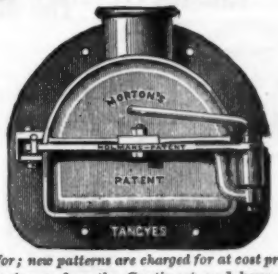
Sole Makers of **MORTON'S** Patent Self-Sealing **RETORT-LIDS,**

With Anti-Friction CATCHES, and Self-Sustaining CROSS-BARS.







Price of Mouthpieces depends on number required, which please state when inquiring. The sizes given in list we have patterns for; new patterns are charged for at cost price.

These Patent Retort Lids and Fastenings are in extensive use in most of the Gas-Works in Great Britain, America, and on the Continent, and have almost entirely displaced the older method of sealing by a luting of lime or other material. The Lids are made in three forms, D, oval, and round (as shown above), in each of which we have a very extensive variety of patterns, from which Gas Engineers contemplating the adoption of these lids are recommended to make their selection, in order to avoid cost of pattern making, delays, &c., &c.

Mouthpieces with Circular Lids for Oval Retorts.

Pattern No.	Diam. Mouth.	Internal Dimensions of Retort.	Length of Mouthpiece.	PRICE, Lid and Fittings without Mouthpiece.
13658	14 ins.	14 × 12 ins.	15 ins.	£0 19 0
4356	14 ,,	18½ ,, 12 ,,	19½ ,,	0 19 0
6851	15 ,,	16 ,, 14 ,,	13 ,,	1 0 0
3629	15 ,,	18½ ,, 13½ ,,	14 ,,	1 0 0
3580	15 ,,	21 ,, 15 ,,	15 ,,	1 0 0
6264	16 ,,	18½ ,, 15½ ,,	15½ ,,	1 1 0
5210	16 ,,	20 ,, 14 ,,	15 ,,	1 1 0
6263	16 ,,	24 ,, 16 ,,	13½ ,,	1 1 0
5370	17 ,,	20 ,, 14 ,,	14 ,,	1 3 0
6832	17 ,,	20 ,, 14 ,,	17 ,,	1 3 0
6183	17 ,,	20 ,, 15 ,,	15 ,,	1 3 0
4289	17 ,,	21 ,, 15 ,,	14 ,,	1 3 0
5270	17 ,,	23 ,, 14 ,,	14 ,,	1 3 0
3631	18 ,,	18 ,, 14 ,,	20 ,,	1 5 0
3681	18 ,,	21 ,, 14 ,,	13½ or 15 ,,	1 5 0
3554	18 ,,	21 ,, 15 ,,	14½ ,,	1 5 0
7957	18 ,,	22 ,, 16 ,,	14 ,,	1 5 0
8048*	19 ,,	25½ ,, 15 ,,	18 ,,	1 8 6

Mouthpieces with Oval Lids for Oval Retorts.

Pattern No.	Dimensions of Mouth.	Internal Dimensions of Retort.	Length of Mouthpiece.	PRICE, Lid and Fittings without Mouthpiece.
9800	18 × 14½ ins.	18 × 14½ ins.	15 ins.	£1 5 0
9205	20 ,, 12 ,,	24 ,, 14 ,,	10½ ,,	1 10 0
10000	20½ ,, 14½ ,,	20½ ,, 14½ ,,	15 ,,	1 10 0
9680	21 ,, 15 ,,	21 ,, 15 ,,	15 ,,	1 12 0
10056	21 ,, 14½ ,,	21 ,, 14½ ,,	15½ ,,	1 12 0
13218	21 ,, 15 ,,	21 ,, 15 ,,	17 ,,	1 12 0
10514	22½ ,, 18½ ,,	22½ ,, 18½ ,,	13½ ,,	1 13 0
13766	20 ,, 17 ,,	20 ,, 17 ,,	15½ ,,	1 15 0
13269	24 ,, 15 ,,	24 ,, 15 ,,	16 ,,	1 18 0

190

Mouthpieces for Round Retorts.

Diam. .. .. ins.	14	15	16	17	18
Price, Lid and Fittings without Mouthpiece £	0 19 0	1 0 0	1 1 0	1 3 0	1 5 0

Mouthpieces with Circular Lids for D Retorts.

Pattern No.	Diam. Mouth.	Internal Dimensions of Retort.	Length of Mouthpiece.	PRICE, Lid and Fittings without Mouthpiece.
5348	14 ins.	14 × 18 ins.	7 ins.	£0 19 0
3463	15 ,,	15 ,, 18 ,,	14 ,,	1 0 0
6678	15 ,,	15 ,, 14 ,,	12 ,,	1 0 0
3661	15½ ,,	15½ ,, 18 ,,	12 ,,	1 1 0
13052	16 ,,	16 ,, 18 ,,	18 ,,	1 1 0
5601	16 ,,	16 ,, 14 ,,	15 ,,	1 1 0
6827	16 ,,	16 ,, 14 ,,	17 ,,	1 1 0
4494	16 ,,	16 ,, 14 ,,	14 ,,	1 1 0
3548	16 ,,	16 ,, 15 ,,	12½ ,,	1 1 0
6677	16 ,,	16½ ,, 13½ ,,	12½ ,,	1 1 0
9645	16 ,,	16½ ,, 18½ ,,	12½ ,,	1 1 0
4434	16 ,,	17½ ,, 14 ,,	14 ,,	1 1 0
6469	16 ,,	18 ,, 14 ,,	15 ,,	1 1 0
9015	16 ,,	18 ,, 14 ,,	18½ ,,	1 1 0
4327	16 ,,	18 ,, 15 ,,	15½ ,,	1 1 0
8049*	16 ,,	18 ,, 15 ,,	17½ ,,	1 1 0
6137	16 ,,	20½ ,, 13½ ,,	13½ ,,	1 1 0
5918	17 ,,	18 ,, 14 ,,	14 or 17 ,,	1 3 0
5053	17 ,,	19½ ,, 13 ,,	14½ ,,	1 3 0
7548	17 ,,	20 ,, 13 ,,	15 ,,	1 3 0
6468	17 ,,	20 ,, 16 ,,	15½ ,,	1 3 0
4316B	17 ,,	21 ,, 14 ,,	14 ,,	1 3 0
7975	17 ,,	21 ,, 15 ,,	14½ ,,	1 3 0
13459	17 ,,	21½ ,, 13½ ,,	15 ,,	1 3 0
12990	18 ,,	18 ,, 15 ,,	15 or 19 ,,	1 5 0
7135	18 ,,	18½ ,, 15 ,,	18 ,,	1 5 0
10221	18 ,,	18 ,, 16 ,,	12½ ,,	1 5 0
4506	18 ,,	20 ,, 13 ,,	19½ ,,	1 5 0
6479	18 ,,	20 ,, 13 ,,	15 ,,	1 5 0
6818	18 ,,	20 ,, 13½ ,,	17½ ,,	1 5 0
4083	18 ,,	20 ,, 15 ,,	16 ,,	1 5 0
5306	18 ,,	20½ ,, 14 ,,	13½ ,,	1 5 0
13295	18 ,,	20½ ,, 14 ,,	19½ ,,	1 5 0
7356	18 ,,	20½ ,, 13½ ,,	13 ,,	1 5 0
4569	18 ,,	21 ,, 14 ,,	18 ,,	1 5 0
3628	18 ,,	21 ,, 15 ,,	16 ,,	1 5 0
7840	18 ,,	22 ,, 12½ ,,	13½ ,,	1 5 0
7971*	20 ,,	20 ,, 15 ,,	18 ,,	1 11 0

*Patterns marked * have Sockets at back to connect to Retorts; all the others are flanged. Patterns marked* B *have curved bottoms.* 191

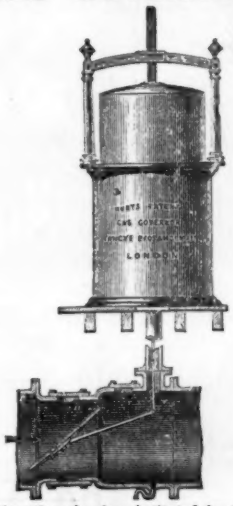
Mouthpieces with D Lids for D Retorts.

Pattern No.	Dimensions of Mouth.	Internal Dimension of Retort.	Length of Mouthpiece.	PRICE, Lid and Fittings without Mouthpiece.
12292	15½ × 13 ins.	15½ × 13 ins.	12 ins.	£1 2 0
9967	16 ,, 14 ,,	16 ,, 14 ,,	15½ ,,	1 3 0
13574	16½ ,, 13½ ,,	16½ ,, 13½ ,,	12½ ,,	1 4 0
9899	18 ,, 12 ,,	18 ,, 12 ,,	14 ,,	1 4 0
12980	16 ,, 16 ,,	16 ,, 16 ,,	18 ,,	1 6 0
13900	18 ,, 13½ ,,	18 ,, 18 ,,	15 ,,	1 6 0
9912	18 ,, 13½ ,,	18 ,, 13½ ,,	17 ,,	1 6 0
9962	18 ,, 13½ ,,	18 ,, 13½ ,,	16 ,,	1 6 0
10982	18 ,, 13½ ,,	18 ,, 14 ,,	15 ,,	1 6 0
11098	18 ,, 14 ,,	18 ,, 14 ,,	12 ,,	1 6 0
9492	20 ,, 13 ,,	20 ,, 13 ,,	15 ,,	1 10 0
9208	20 ,, 13 ,,	20 ,, 13 ,,	19½ ,,	1 10 0
10251	20 ,, 13 ,,	20 ,, 13 ,,	15½ ,,	1 10 0
12964	20 ,, 13 ,,	20 ,, 13 ,,	18½ ,,	1 10 0
9909	20 ,, 13½ ,,	20 ,, 13½ ,,	17 ,,	1 10 0
12969	19½ ,, 15½ ,,	19½ ,, 15½ ,,	14 ,,	1 11 0
13781	20 ,, 15 ,, Front.	21 ,, 15 ,,	15 ,,	1 11 0
	21 ,, 15 ,, Back.			
7692	21 ,, 15½ ,,	21 ,, 15½ ,,	16 ,,	1 11 0
12978	20 ,, 16 ,,	20 ,, 16 ,,	17 ,,	1 11 0
13252	20 ,, 16 ,,	20 ,, 16 ,,	18 ,,	1 11 0
13220	21 ,, 15 ,,	21 ,, 15 ,,	17 ,,	1 11 0
8977	21½ ,, 13½ ,,	21½ ,, 13½ ,,	18½ ,,	1 11 0
8976	21½ ,, 13½ ,,	21½ ,, 13½ ,,	18½ ,,	1 12 0
10497	21½ ,, 13½ ,,	21 ,, 13½ ,,	18½ ,,	1 12 0
8037	21½ ,, 13½ ,,	21½ ,, 13½ ,,	18½ ,,	1 12 0
9908	21½ ,, 13½ ,,	21½ ,, 13½ ,,	15 ,,	1 12 0
10404	21½ ,, 13½ ,,	22 ,, 14 ,,	18½ ,,	1 12 0
12410	21½ ,, 13½ ,,	22 ,, 14 ,,	12 ,,	1 12 0
13822	21½ ,, 13½ ,,	22 ,, 14 ,,	15 ,,	1 12 0
10515	22½ ,, 12½ ,,	22½ ,, 12½ ,,	18½ ,,	1 12 0
7924	24 ,, 14 ,,	24 ,, 14 ,,	18½ ,,	1 13 0
13807	24 ,, 15½ ,,	24 ,, 15½ ,,	16 ,,	1 14 0
9015B	25 ,, 14 ,,	25 ,, 14 ,,	12½ ,,	1 14 0
10932	25 ,, 14 ,,	24 ,, 14 ,,	18½ ,,	1 15 0
12944B	22 ,, 16 ,,	22 ,, 16 ,,	16 ,,	1 15 0

Patterns marked B *have curved bottoms.* 192

HUNT'S PATENT EQUILIBRIUM DIRECT MAIN

GAS GOVERNOR.



In this Governor a throttle valve is substituted for the ordinary suspended cone; all external communication being avoided by placing the lever or radius arm inside the valve chamber upon the disc.

The disc is carried upon steel centres, upon which it is accurately balanced.

4 ins. ... £17 0	8 ins. ... £25 0	14 ins. ... £42 0	20 ins. ... £60 0
5 ,, .. 20 0	10 ,, .. 33 0	16 ,, .. 46 0	24 ,, .. 72 0
6 ,, .. 22 10	12 ,, .. 38 0	18 .. 50 0	36 ,, .. 130 0

196

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The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.
Since then we have not Exhibited for Prizes.

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DRY GAS-METER MANUFACTURERS,

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1st—Are a remedy for all the defects of Wet Meters.
2nd—Are suitable for all climates, whether hot or cold.
3rd—Incur no loss of Gas by Evaporation.
4th—Cannot become fixed by Frost, however severe.
5th—Are the most accurate and unvarying measurers of Gas.
6th—Prevent jumping or unexpected extinction of the Lights.
7th—May be fixed either above or below the level of the Lights.
8th—Cannot be tampered with without visibly damaging the outer case.
9th—Will last much longer than Wet Meters.
10th—Will not cost more than one-half for repair that Wet or Water Meters do.

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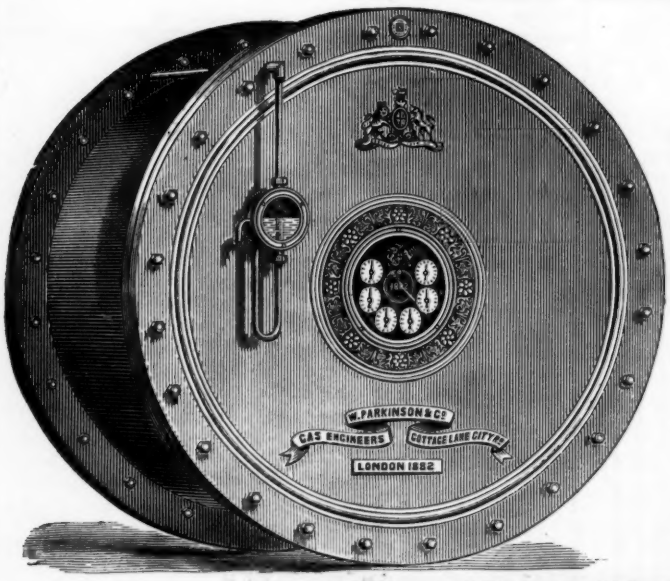

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THREE-PARTITION DRUMS

MORE THAN

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Varying in size from **1200** to **200,000** cubic feet per hour, have been sold, fitted with

THREE-PARTITION DRUMS,

Since their introduction three years since.

ROUND METERS as above are kept in Stock in all Sizes, ready to send away at the shortest notice. Compact, portable, and very easily fixed. An Improved Overflow Water-line Regulator fitted to every Meter.

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CONTENTS.

EDITORIAL NOTES:—
Gas, Lighting, &c.— PAGE
The Later Phases of the Strike 99
The New Departure in Gasholder Construction at Northwich 100
Mr. John West on Gas and Electric Lighting 100
The Old and the New 101
ESSAYS, COMMENTARIES, AND REVIEWS:—
Gas and Water Companies in the Stock Market. 102
Electric Lighting Memoranda 102
More Reflections on the Strike 103
NOTES:—
Improvements on Coze's System 104
A New Apparatus for Testing Spent Oxide 104
The Duty of Coke-Fired Water-Tube Boilers 104
A Measure of the Tautness of Ropes 104
COMMUNICATED ARTICLE:—
The Chemistry of Illuminating Gas. By Norton H. Humphrys, Assoc. M. Inst. C.E. 105
TECHNICAL RECORD:—
Gadd and Mason's Spiral-Guided Gasholder at Northwich 106
Manchester Association of Engineers—Mr. John West on Gas and Electricity 108
The "Meteor" Storm-Proof Lamp 110
REGISTER OF PATENTS:—
Syphon and Test-Boxes for Gas-Mains—Good, R. 110
Coin-Freed Apparatus in Connection with Gas-Meters—Laycock, J. . . . 110
Gas-Lamps—Wenham, F. W. 110
Gas-Engines—Pinkney, C. W. 111
Gaseous Mixtures for Use in Producing Light, Heat, and Power—Tatham, E. 111
Manufacture of Coal and other Like Gases—Tatham, E. 112
Supplying Air to Carburetters—Badlam, E. B. 112
Patent Notices 112
CORRESPONDENCE:—
Mr. Humphrys on the Specific Gravity of Gases and the Dinsmore Process. 112
Is There Anything New Under the Sun? 112
Strike of Gas Stokers at Mossley 112
LEGAL INTELLIGENCE:—
Central Criminal Court—The Charge of Inciting to Murder Mr. G. Livesey; Firing at a Gas Stoker 113
Newton County Court—The Deduction of Gas-Rental from Dividends . . 113
MISCELLANEOUS:—
Gas Workmen and the Labour Question—
The South Metropolitan Company and their Difficulties 114
The Stokers' Strike at Mossley, ... 115
Cleckheaton Local Board Gas Supply—Enlargement of the Works . . . 115
Proposed Purchase of the Canterbury Gas and Water Works by the Corporation 115
Lothammer Gas Company, Limited 116
Pará Gas Company, Limited 116
Bordeaux Gas Company 116
Proposed Extension of the Bradford Electricity Works 116
Notes from Scotland 117
Current Sales of Gas Products 118
Gas and Water Companies' Stock and Share List 119
PARAGRAPHS.—The Gaslight and Coke Company's Dividend, 101—Colonial Examinations in Gas Manufacture, 101—Mr. Edward Berney, 101—The Edinburgh International Electrical Exhibition, 101—Title and Index to Vol. LIV., 102—The Salford Corporation and Mr. Ellis Lever, 103—The "Practical Engineer" Pocket Book and Diary, 104—The Electric Lighting Projects for London, 104—Death of Mr. Craig-Sellar, M.P., 104—More Electric Light Accidents, 107—New Water-Works for Amsterdam, 107—The Town Clerkship of Manchester, 109—The Pennsylvania Oil-Wells, 109—Mr. Christian Allhusen, 109—The Recent Attack on Electric Light Wires in New York, 109—Lighting and Ventilation by Gas, 109—The Proposed Electric Lighting of Launceston (Tasmania), 110—Gas Explosion at Lurgan, 112—Halifax Corporation Gas Supply, 112—Further Dissatisfaction with the Electric Light at Leamington, 112—Sales of Shares, 113—Reduction in Price by the Kingsbridge Gas Company, 113—The Rochdale Gas Committee and their Out-District Customers, 113—Issue of Additional Stock in the Yeadon Water Company, 113—Explosion of Gas at Newcastle, 116—The Electric Lighting at Barnet, 117—Further Serious Subsidences of Land at Northwich, 117—Proposed Introduction of Mechanical Stokers at Oldham, 117—Advance in the Price of Gas in Cornwall, 117—Shrewsbury Water Supply, 117—The Leeds Corporation and Electric Lighting, 117—Stockton and Middlesbrough Water Board, 118—The Warrington Corporation and the Proposed Purchase of the Water-Works, 118—Lymm Water Supply, 118—The Condition of the Plympton Water Supply, 118—Inauguration of the Barry and Cadoxton Gas-Works, 118—The Wakefield Corporation Water Committee in a Dilemma, 118—The Proposed Storeage Reservoir for Plymouth, 119—The Accident at the Saltley (Birmingham) Gas-Works, 119—The Purchase of Additional Land for Gas-Works Purposes at Leeds, 119—Elloughton (East Yorkshire) Water Supply, 119—An Electric Lighting Company for Birmingham, 119—Fatal Accident at the Festiniog Gas-Works, 119—Castleford Water Supply, 119—The Dewsbury and Heckmondwike Water Bill, 119—Northern Coal Trade, 119—Bankruptcy of Mr. T. Wilkinson, 119—The New Water-Works for the Rhondda, 119—Bankruptcy of Mr. T. W. Stears, 119.

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THE
JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 21, 1890.

The Later Phases of the Strike.

THE progress of the South London gas stokers' strike cannot be said to lack either incident or interest. Indeed, it is somewhat irritating on this account, because there is enough going on to keep public attention fixed upon the struggle, while the end is put off from week to week. All the conferences, meetings, and letters to the newspapers, to say nothing of the attendant Police Court assault cases, which enter into the daily chronicle of this protracted strike, do not appear to amount to anything. The Company keep on their way, through good and evil report; and the strikers seem to be as stubborn as ever against any solution of the difficulty which does not include their reinstatement as a body in their old places. As the Directors have already declared this to be impossible, the matter hangs precisely where it did; and the affair can only end by the exhaustion of the men. So far as the Company are concerned, the strike conditions are fast giving way to the ordinary system of working. The bonus is no longer paid, and the new hands are rapidly settling down into established retort-house workers. Seeing that they are drawn from exactly the same classes of labourers as the men whose places they have taken, this result was foreseen to be only a question of time. The strikers flattered themselves that they had a monopoly of the gas-making faculty. They altogether forgot the days when they were novices themselves. Yet there is not one of them but would scorn the imputation of having been longer than a month in getting into the way of the work. If the victims of Union folly have thought over the subject at all, they must have felt that every day they remained out diminished the difference between themselves and their successors, who are now stokers, firemen, pipe-jumpers, cokeys, coalies, and so forth, in their different orders, as truly as the old hands who have thrown away these employments under the delusion that they were necessary to the gas supply of South London. There has naturally been a good deal of difficulty in drilling the recruits into their duties. Unused, for the most part, to work in organized gangs, in which every unit depends upon the others, and also unaccustomed to the clockwork regularity essential to good stoking, the men have required incessant supervision, accentuated by the elimination of hopeless wasters. The good money paid has also been a sore trial to many of them, who never in their lives had so much to spend. This is being lived down, however; and all that is required is to gradually "speed up" the gangs until they attain the ideal style of first-rate stokers.

These being the circumstances, and having spent so much money and taken such infinite pains to achieve the result so far attained, it is not to be supposed by any sane man that the Directors would throw everything away at the request of a deputation or the demand of a newspaper, and sacrifice their useful servants to gain masters in exchange. For this is what it amounts to, as anyone can see. The Directors have made a heavy sacrifice in order to retain the mastery of their own works, which would escape them the moment they were weak enough to admit the Union men back again. Now they are in the position that if a man is idle, incompetent, or insolent, they can discharge him; which, to say the least of it, is not everywhere the case. The complaint which, as recorded in our report of the Barking Road meeting of Sunday week, was made by Mr. G. C. Trewby, of the conduct of the men employed by the Chartered Company, is a significant comment on the effect of the dual control existing wherever the Union is recognized. We can easily believe that Mr. Trewby did not relish addressing a complaint like this to such an authority; but what could he do? The Union leaders assert their supreme power whenever they speak. Thus, at the same meeting, Mr. Ward, speaking for the Union Executive, denied that the intention of calling out the Union men employed by the Chartered Company had ever been entertained. On the contrary, "they thought it was their duty to keep the men "on that side of the river fully employed, so that they could "assist the men on strike on the other side;" which, by the way, they are not very enthusiastic in doing. This policy is precisely what we have ascribed to the Union all along, for we never thought the leaders so foolish as to undertake two first-class strikes at once. But mark the calm arrogance of the expressions used by the speaker. They, the Union Executive, kept the men at their work simply because they wanted their money, not because they had the slightest sense of the responsibility of the men to their employers, or that they imagined them to be contented in their work. These are exploded ideas in the estimation of a Trade Unionist. Ward's admission only strengthens our long-entertained opinion, expressed last week, that the South Metropolitan strike saved the gas supply of London, which was for weeks in danger of being extinguished by a breath from such men as Ward and Thorne.

The promised reply of the Union leaders to the strictures passed by the JOURNAL on their position and policy, turned out to be a very poor affair after all. We have kept our columns open to every useful contribution to the discussion of the strike from all quarters, and have several times sent special reporters to the men's meetings. It is not our fault if so little is said on these occasions to remove the general opinion that the strike was a huge blunder, perpetrated by a practically irresponsible few at the expense of

the silent, misguided, suffering many. The strike leaders utterly failed to measure the powers with which they undertook to contend. They imagined that, having judged their own cause to be right, they would be left free to employ any amount of intimidation and violence to gain their ends; and now they are foiled they keep up their own courage by abusing Mr. Livesey, and sustain their infatuated followers by silly fables, not to call them by a harsher term. What can one think of the fate of a popular movement kept alive by such *pabulum* as that offered to the Peckham Rye demonstrators last Sunday week by Mark Hutchins, President of the Gas Workers' Union, who told his hearers that the Company "were charging their customers for "double the quantity of gas that was consumed, because "the blacklegs wasted more gas than they made, and sent "into the mains instead huge quantities of sulphur and "air." This is a sample of the stuff with which the men have been amused, spiced by an occasional revolutionary address, or by the even more pungent trash for which the man Wier has endured a painful, but salutary sequestration, followed by a contemptuous dismissal into obscurity. If the men or their leaders had anywhere indicated a rational appreciation of their case and prospects, we should have recorded and brought it into light; but they have chosen to be deluded, and must bear the consequences.

More mass meetings were called by the strike leaders for Sunday last; the scene this time being shifted once more from the outlying Barking Road and the dully suburban Peckham Rye to the central and fashionable Hyde Park. This was the scene of Wier's unfortunate eloquence; and it is safe to assume that the organizers of the meeting took particular care to avoid repeating the mistake perpetrated in his case. It must have struck many a reader of the reports of these open-air meetings, that mob oratory is remarkably plentiful among our town populations of the present age. It has been supposed that the ability to deliver an oration capable of swaying the minds and rousing the passions of men in public meetings is uncommon, at least among English people. This notion must be classed among other superstitions, if we are to judge from the evidence of these stokers' meetings. The men who have brought about the strike, and who have taken upon themselves the management of the subsequent proceedings, have shown a jealousy of professionals like Burns, Mann, Tillett, Champion, and the rest who made such capital out of the dockers' strike, which has gone to the extent of keeping these gentry at arms' length. They retaliate by gently hinting that their rivals are making an astonishing mess of their strike, and that if they had been consulted at the proper time, matters might have turned out very differently. Amid all these mutual amenities of agitators and demagogues, who exemplify to-day the truth of the old adage about two of a trade being unable to agree, one certain fact appears—they can all talk. Wise observers of human nature have always accused it of weakness in respect of attaching undue respect to rhetoric. We have heard it argued that the most civilized as well as the least cultured audiences are too apt to be carried away in admiration of a fluent speaker, and to ascribe all manner of ability to the man who can only amuse the multitude with his glib tongue. It has been stated over and over again that the knack of speaking fluently in public is really a very low sort of gift, not arguing the possession of any kind of real power in its possession; and truly the speaking at these stokers' meetings bears out this reasoning. Many scores of speeches have now been made in the ears of the strikers since this movement began; and, apart from the trivial circumstance of their being stuffed with lies of the kind already mentioned, most have been very effective, regarded as examples of popular oratory. We are apt, when reading in history of the oratorical achievements of notorious popular leaders, from Macaulay's Icilius to Camille Desmoulins, to imagine that these men must have been wonderfully eloquent speakers. Although it may seem a long step down from such names to those that have been brought into notoriety in connection with the gas stokers' strike, we suspect the owners belong to the same order—that of men with one idea, whose audiences are prepared by conviction, suffering, or common sentiment to applaud every word they hear. Such men are nothing without their hearers; but when brought together under favourable conditions, speakers and hearers act and react upon each other until their combined sound has shaken thrones. It is a lamentable reflection for the strike orators that their fiery periods are not able to shake Mr. George Livesey. By-and-by the men will grow tired of filling themselves with the windy promises of the Thornes and Hutchinses, and will long after more solid fare. Until this happens, however, we may expect mass meetings week by week, and the same amazing outpouring of speech to waste; none of it so vividly expressing the true situation as the cry of the irreverent street boys to the processions of strikers: "I had a good job, and I left it."

The New Departure in Gasholder Construction at Northwich.

THE successful experiment at Northwich on Saturday, to which reference is made in another column, may be taken to have demonstrated the feasibility of dispensing with the upper guide-framing of gasholders. That which has been assiduously preached and advocated of recent years is now proved; and though many will still hesitate to follow Mr. S. S. Mellor in so daring a departure from custom, their faith will receive a severe shock from the success which has attended this project. Mr. Gadd and his friends are to be congratulated not only upon the attainment of their wishes, but upon having found so early an opportunity of putting their ideas into practice. It is not every inventor—however ready he may be to establish the mathematical certainty of his position—who can find men ready to listen to his theories and take the risk of their failure. A very short time has elapsed since the invention for which Mr. Newbigging stood sponsor was first publicly described; and the fact that it is so soon carried into effect may be taken as one amongst other proofs that the discussion on guide-framing has been productive of good. Whether this is the only, or indeed the best, method of attaining the desired end, time will show. Mr. Gadd's idea is undoubtedly ingenious, and so far as it has gone it is successful. But whether his single spiral guiding is better than the alternating spiral of Mr. Livesey, or the wire-rope and pulley arrangement of Mr. Pease, it is impossible to say. Still a large number of practical engineers and managers of works are more or less committed to the abolition of superstructural framing. The day is probably not far distant when the ornamental columns and girders, which now surround gasholders, and afford some scope for the display of taste and ingenuity in their designers, will be regarded with only an antiquarian interest. In the meantime there will be great anxiety to learn something as to the cost of the new system. It will be noticed that this is a point on which nothing was said at Northwich. Information will no doubt be forthcoming in the long run; but meantime it is, no doubt, safe to say that the first holder on the new system has cost more in proportion than any subsequent one will. An initial experiment is almost certain to be expensive. Unforeseen difficulties present themselves; and in one way or another the cost is run up. Then there is always a tendency, as in this case, to take the utmost precaution against failure, even though it should lead to over-elaboration of details. According to Mr. Gadd (who has supreme confidence in his theories, and the mathematical rules on which they are based), the new holder is three times stronger than it requires to be. Perhaps some allowance may be made for the exuberance of the parental phraseology. Mr. Gadd could hardly be expected to speak in other than terms of affection of his offspring; but though his figures may require modification, it is easy to understand that the structure is possibly in parts stronger than it actually need be. The additional fact has also to be borne in mind, that the holder has been built without very close regard to its cost. It was an experiment; and the contractors seem to have been told to go ahead and make a good job of it. They appear to have done this; and we can only hope, for the sake of all interested, that the months of the winter which have yet to come may bring such storms and gales as will put the stability of the structure to as severe a test as even its most ardent friends or most bitter opponents can wish.

Mr. John West on Gas and Electric Lighting.

IN another column will be found an abstract of the address delivered by Mr. John West on the occasion of his inauguration as President of the Manchester Association of Engineers. It will be read with interest at the present juncture, when most of the published statements respecting the competition between gas and electric lighting come from electricians. Mr. West has prepared a new and decidedly striking table exhibiting the comparative cost of

gas and electric lamps in the three typical cities of London, Manchester, and Aberdeen, where the average quality of the gas supply differs so conspicuously as to make separate computation desirable. It appears from this table, among other things, that gas of the average quality of 20 candles is more economical than 16-candle gas; but this is only because they are both taken at the same selling price. If he had chosen, Mr. West could have found a cheaper gas supply than anything he has selected; but he perhaps preferred not to incur the criticism of going out of the way to make a good case for gas. The last column of the table is rather curiously expressed. It states the economy of gas as a multiple of the electricity—meaning, it must be supposed, that with common burners gas is from 3·5 times cheaper than electricity in London to 8·7 times cheaper in Manchester or Aberdeen when regenerative burners are used. It is not a common way of stating the case, and demands care in the reading. So far as we remember, nobody has previously made a comparison of this kind with due credit to the gas as being consumed to the best effect in a good burner, although it is invariably assumed that the incandescent electric lamp gives its full rated effect throughout its life, which is notoriously not the case. Again, the cost of the gas lighting is a positive fact; for gas can be had in the cities named at the price given, and it there returns a profit to its vendors. On the other hand, it is a pure assumption that electricity, even at 8d. per unit, supplies the basis of a paying and permanent business. In an interesting statement respecting the cost of electric light for a bank, Mr. West made out that the electricity as developed by gas-engines on the premises, cost 6·84d. per unit, including everything. If the current had been bought from a supply company at 8d. per unit, the interest on fittings and renewal of lamps would have brought up the charge to 9·26d. per unit. This relates to an accumulator plant; but Mr. West brings out the unexpected result that, by the use of gas-engines on their own premises, large consumers —such as banks, insurance offices, &c.—can already supply themselves with electric lighting at a saving as compared with anything a central station company can do for them. In connection with this discovery, he made the altogether novel suggestion for the addition of electric lighting to gas undertakings, by the hiring out of gas-engines and dynamos. Of all the projects that have been ventilated for the fusion of electric lighting and gas interests, this is perhaps the least objectionable. Altogether, this portion of Mr. West's address constitutes a valuable addition to the literature of gas and electric light engineering.

The Old and the New.

THE lecturing season is waning, and all educational institutions which employ this means of instruction during the winter months have by this time broken the back of their programmes. Still there are a good many long evenings to be filled up yet before the lengthening days attract attention to prospective outdoor pursuits. Gas lighting and electricity, flame and combustion, and all the allied subjects in which our professional readers are, or ought to be, acknowledged experts, have had their due share of study. In how many instances has gas lighting received credit for its social work in rendering popular evening assemblies possible? It is a useful preparation for lecturers on this class of subjects, in which the technical aspect does not exclude the social effect, to refresh their minds by perusal of old prophecies of what was to be expected of improvements that were then novelties, but are now accomplished facts. We all know that a good deal of nonsense was at one time talked for and against gas lighting; and it is instructive to contrast what was expected with what has actually come to pass. It has seldom happened that the prophets either of good or evil have been justified in their sayings. Good and evil have both come from gas lighting, as from railways, telegraphs, and other advances of material civilization; but rarely in the predicted shapes. We who enjoy these modern advantages (as, on the whole, we believe them to be) may not properly realize to the full their benefits and drawbacks. We are naturally prone to overrate the former and ignore the latter, in the vulgar belief that all changes from the customs of our fathers in which we participate, must necessarily be improvements; and, in short, that we are wiser and better than any generation that has preceded us. As we grow old, too, we naturally disparage the nascent changes that we observe around us, which proclaim that our successors are not going to be content with our ways. So we are tempted to think that civilization has touched the high-water mark in our own experience, and that as our predecessors were ignorant fellows, so our descendants are likely to "go to the dogs" if they abandon our rules.

There is nothing like the study of past times for correcting this natural, but at the same time objectionable human weakness. Some of us, however, run to the opposite extreme, and are fond of prophesying all manner of bright things of the Golden Year which is coming in, as they think, with some improvement in which they are interested. Our friends the electricians are most given to this practice just now; but we could parallel them with some prophecies of early gas enthusiasts of the Winsor school. They are going to turn night into day, to abolish all sorts of evils which they picture as due to burning gas indoors and out, and generally to add to the sum of human health and happiness. That is nothing to what Winsor was going to do. There was a time when the elder branch of electrical engineering—telegraphy—was expected to perform even greater wonders. Professor Alonzo Jackman, who taught in the Norwich University, Vermont, in 1846, published at that time a sketch of an Atlantic telegraph cable scheme, the results of which were confidently expected to include the abolition of war, the entombment of heathenism, and the deliverance of civilization from all contaminating influences. Well, we have our Atlantic cables, not exactly according to Professor Jackman's plan, but even better in a technical sense than anything he could have imagined; but the political and social consequences have not been like his dream. So it is with every realized project that enables us to check the fond anticipations of the prophet by the accomplishments of the age. Gas lighting, railway transit, telegraphy —they are all good or bad according to the use we make of them. In themselves they are nothing. Human nature has an astonishing capacity for assimilating the products of time, and remaining much the same afterwards. Do gas-lit assemblies, railroad travelling, telegraphic news, telephonic conversations—all the innumerable triumphs of the material civilization of the day—discount the soul of a Sidney, the wisdom of a Bacon, the character of a Cromwell? In view of the superficial journalism which forms the daily reading of the majority, and in which means and ends, processes and results, accidents and essentials, are all ingloriously jumbled together, and everything that pretends to be new is hailed as the best, it is well to keep a few of these old truths in mind.

The Gaslight and Coke Company's Dividend for the six months ending Dec. 31 last will be at the rate of 13¾ per cent. per annum; leaving £198,679 to be carried forward.

Colonial Examinations in Gas Manufacture.—At the examinations in "Gas Manufacture" held in Sydney in May last year, in connection with the City and Guilds of London Institute, Mr. Henry Hoare passed second class in the Honours grade.

Mr. Edward Berney, who for many years occupied the position of Chairman of the Croydon Gas Company, passed away last Sunday week, at the mature age of 72. The deceased gentleman took a very active part in the direction of the affairs of the Company; but some three or four years ago, he had to resign the Chairmanship into the hands of Mr. Charles Newton on account of ill-health, though he still continued a member of the Board. By his colleagues and the staff, he was much esteemed; and the benefit of his long experience in the management of the concern will be greatly missed by the former.

The Edinburgh International Electrical Exhibition, which will be open to the public during the coming summer, bids fair to so far eclipse the exhibition of 1886 (the third of the kind held in Edinburgh), as that did its predecessors. The exhibits will be classified in 22 groups—6 being devoted to electrical engineering and inventions, and 14 to general inventions and industries, with special sections for women's and artizans' industries. The electrical exhibits will, of course, be very comprehensive; a large number of firms and companies having promised their co-operation. The section devoted to "Hygiene" (XI.) will comprise lighting apparatus other than electric, and also water supply, heating and ventilating, and sanitary appliances. The financial prospects of the undertaking are regarded by the Finance Committee as eminently satisfactory, owing to the larger sums obtained for concessions as compared with former exhibitions. The general management is in the experienced hands of Mr. S. Lee Bapty, F.R.G.S.; the secretarial duties being discharged by Mr. G. E. Watson, C.A. The time for receiving applications for space expired last Wednesday; and it is calculated that the available accommodation has been applied for more than three times over.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 119.)

AGAIN we have to record a week of depression on the Stock Exchange—the second week running; and from much the same cause. The scarceness and dearness of money were such as to put a very strong break on to the wheel of speculation; and transactions in general were much reduced. The position of the Money Market is no doubt improving, but very slowly; and until rates go down a good bit more, business will remain very slack. Notwithstanding the dull time, prices have not suffered. There has been no desire to sell; and people are simply remaining inactive, waiting for things to mend. Apart from the Money Market, the course of events has been favourable—notably in regard to foreign affairs. Gas has been a quieter market than it was the week before; and it has not developed much change in values. What few quotations have moved at all, have gone in the upward direction, with the sole exception of Gaslight "A." This stock opened firm; and though rather quiet, it steadily improved until on Thursday it was marked at 254, with a rise of 1 in the quotation. On Friday, however, it receded; and on Saturday was done as low as 251, with a drop of 2 off the quotation, or a net loss of 1 on the balance. For the cause of the relapse, we can only look to the announcement of the Directors that after declaring a $13\frac{3}{4}$ per cent. dividend for the last half of 1889, the balance to be carried forward would be £198,679. From the first half of 1889 the balance carried forward was £285,000; and this time last year the balance was nearly £305,000. So that for the year the surplus earnings have been drawn upon to the extent of £106,000. But while the "A" stock was weaker, some of the 10 per cent. preferences made a further rise; and the "H" 7 per cent. maximum also improved. South Metropolitans have been very little dealt in, and at about average figures; the debenture stock being in best demand. Commercials have not had a single transaction marked in them; but the old stock was put up 2. Suburbans and Provincials have remained quite unnoticed. General quietude has prevailed among the Foreign undertakings; the inclination for the most part being in favour of better prices. The only actual change is an improvement of 1 in European. A few transactions were effected in the Water Companies on two or three days; but the rest of the week they were left quite neglected. In the result; Lambeth is a little higher, and Southwark lower.

The daily operations were: Gas was very quiet on Monday; nothing coming in for much notice except Imperial Continental. Prices were a fair average. In Water, Lambeth 10 per cents. were in good demand, and more than recovered their fall of the previous week. There was not much more activity in Gas on Tuesday; and prices remained about the same. European rose 1. Water offered nothing to remark. Gas was even quieter on Wednesday; things being almost at a standstill. The quotation of Gaslight "H" advanced 2. Water was quite a blank. On Thursday, Gas business revived. Many more stocks were dealt in, and prices were good all round. Gaslight "A" rose 1; and Commercial old, 2. In Water, Southwark ordinary fell 2. Friday was a quiet day in Gas. Gaslight debentures and preferences were in favour; the "C," "D," and "E" rising 2. The "A," however, receded 2. Water was not dealt in. On Saturday, Gas was fairly active, and good prices generally were obtained; but Gaslight "A" was not quite so strong.

ELECTRIC LIGHTING MEMORANDA.

The Dangers of Electric Wires, by Messrs. Ferranti and Ince—Mr. Vincent on the Same Subject—The "New York Herald" on Electric Lighting for England.

THE only aspect of electric lighting that appears to interest the public just now is that of the danger to life and property from wires conveying currents. We have recorded the statements offered upon this subject by Messrs. Edison and Westinghouse, the rival American electricians who respectively represent the low-pressure continuous and high-pressure alternating systems. The echo of their strife has reached this country; and it has been considered advisable that the question of safety should be discussed from the English standpoint, with special reference to the Deptford experiment, whence alternating currents of higher pressure than have yet been tried anywhere are to be distributed over London. Accordingly Messrs. Ferranti and Ince, the Engineers responsible for this system, have published in *Engineering* an article on "The Dangers of Electric Lighting," with the intention of pacifying the public mind. Their article is very instructive for amateurs of electricity, as it begins by explaining in clearer terms than can easily be found elsewhere the mysteries of the measurement of electrical currents. It goes on to argue that the Ferranti main for distributing high-pressure currents is perfectly safe, because in this device the supply conductor is enclosed within a tube which is the return conductor; the intervening annular space being filled with insulating material. Hence it is claimed that any leakage from one conductor to the other necessarily goes on inside the cable, which can therefore be held in the naked hand while passing currents of 10,000 volts and upwards, which would mean instant death if passed through the human body. In short, Messrs. Ferranti and Ince flatly say that Mr. Edison does not know everything, and that the question of the safety of electrical currents does not depend upon whether they can be classified as high or low pressure, direct or alternating, but only on the character of the conductors and fittings by which they are intended to be distributed for use. They declare that the deaths and fires caused by electric lighting wires in American towns are explainable by the execrable character of the work done by the companies, and the neglect of all precautions here deemed necessary in the interest of public safety. They scorn the idea that a monopoly should be given to Edison low-tension currents, which may serve, they say, where the competition of electric lamps is with gas at American prices. If such lamps are ever to compete with gas at London prices, it is contended that a more economical system of electrical distribution is called for. "We think we have said enough to show that the dangers of electric lighting are no more in the high-tension system than the low, provided both systems are carried out with equal care, and all proper safety devices are used in the one case and in the other. Without these devices and without this care, neither system is safe." This is all very clear; but the public will want to be assured that these "safety devices" can always be depended upon. With all respect to Messrs. Ferranti and Ince, it may be argued that they appear to place excessive confidence in devices which may, of course, be reliable, but which appear to be too much like fusible safety-plugs of steam-boilers, intended to prevent overheating of flues through lowness of water, to be perfectly satisfactory. Moreover, they claim that there has not been any accident with the mains of the Grosvenor Gallery Company (for which they presumably speak throughout) since they commenced business; but we remember something about a casualty at a tobacconist's in Regent Street, which does not support this claim. However, the paper is a very good one, on the whole.

When one turns from such an article as that of Messrs Ferranti and Ince to that of Mr. Charles W. Vincent on the same subject, appearing in the current number of the *Nineteenth Century*, it is like quitting a workshop for a *dilettante* study. Mr. Vincent has read all that Edison and others have recently written on this subject, and he has a pretty trick of stringing sentences together in the style affected by reporters for the evening newspapers. Notwithstanding the unsatisfactory character of most of his writing, however, Mr. Vincent brings forward one or two things that may be usefully collated with the remarks quoted in the preceding paragraph. The two engineers referred to claim perfect safety for the Ferranti annular main; but Mr. Vincent asks, What about the transformers, or converters, which will be used to let down the high potential of the main to the safe 100 volts to be admitted into the consumer's house by means of the service-wire? There is always some danger, Mr. Vincent asserts, of the converter being pierced; in which case the house wires would be fused, if nothing worse happened, and the house would almost certainly be set on fire. In any case, the converter would come to such an end in time, owing to internal stress—of course, in default of timely removal. Again, Mr. Vincent dwells specially on the risk of dangerous induction, which Messrs. Ferranti and Ince do not say anything about. Altogether, it cannot be said that the frequent discussions, authoritative and otherwise, now brought to bear on this aspect of the electric lighting question tend in any appreciable degree to satisfy the public mind that the deplorable American casualties would not be repeated here if the expected extension of electric lighting is not rigidly supervised by competent authority.

Recently the London edition of the *New York Herald* gave an account, in the usual style of the class of newspaper to which this peculiar publication belongs, of what electricians are doing towards the lighting of English cities and towns. Among the sub-headings of the article is a statement about "All the Country Clamouring for Light, and London soon to Blaze in Splendour." If gorgeous titles could make a good article, these newspapers of the American type would never be dull; but unfortunately, as sometimes happens in other businesses, the signboard is too ornate for the goods sold inside. In the article now under notice, which is largely borrowed from the *Electrician*, a great deal is made of the recent revival of electric light speculation—nothing being said, of course, of the even greater "boom" of seven years ago, which ended so disastrously. The gas strikes are ingeniously mixed up with "the growing demand for electric lighting," by antedating them a year, which is nothing to a practitioner of the New Journalism who admits his indebtedness for his information to a "Capel Court Electrician." To take an estimate of prospective business on the faith of a mere electrician is risky enough; and the same may be said of an ordinary haunter of Capel Court. The combination is, however, amazing; and it can only be said that a man who would credit statements on such authority—anonymous, moreover—would believe anything. The article even ascribes the winding up of several old electrical companies to the rush of the new for priority! The whole communication is, of course, worthless; but, such as it is, it is in circulation and must be noticed, if only as an audacious advertisement.

Title and Index to Vol. LIV.—The title-page and index to Vol. LIV. of the JOURNAL (July to December, 1889) will be ready in the course of the present week; and a copy will be forwarded post free by the Publisher, on receipt of a post-card from any subscriber.

MORE REFLECTIONS ON THE STRIKE.

In the last issue of the JOURNAL there appeared a paragraph containing some comments, from a well-informed Manchester correspondent, on our recent article entitled "Some Reflections on the Strike." The general purport of that article was to compare the plant and equipment of the Manchester Corporation Gas-Works with that on the works of the South Metropolitan Gas Company, from the point of view of adaptability for inexperienced hands. We ventured on the surmise that the quicker rate of recovery to something like the normal productiveness of the carbonizing plant in the case of the South Metropolitan works might be traceable to stage retort-houses and scoop charging, as compared with ground-floor houses and shovel charging. It appears, however, that our explanation lacked comprehensiveness, in not taking account of the part played by machinery in Manchester and London. We are the more desirous not to create a wrong impression in regard to this subject, as the time has not yet come for the publication of any technical memoranda, by the Engineers engaged in either of these strikes, whereby the comparative advantages of various descriptions of carbonizing plant and equipment might be made manifest. As we have already remarked when commenting upon the South Metropolitan strike, it is to be hoped that when matters have settled down, and the Engineers have a little leisure time, an authoritative record of the whole trouble, in all its aspects, will be compiled under Mr. Livesey's direction. In the case of Manchester, unfortunately, there does not appear to be anybody upon whom a call could be made for a comprehensive report upon the strike and its lessons; there being no Chief Engineer responsible for the management of the gas undertaking as a whole. This being so, it is the more incumbent upon outside observers to be careful in avoiding misrepresentations of the circumstances of the strike, or of anything else that happens at this establishment. Our correspondent does not contest our starting-point—that recovery with inexperienced hands was more rapid in South London than in Manchester (and, we may add, Salford), but seems to imply that the superiority could hardly have been due to the presence in one place of stage retort-houses, because at the only Manchester station where there is a retort-house of this description, the difficulties were greater than at the other stations, where ground-floor houses and machine stokers of different patterns are in use. It is not stated, however, whether in the single Manchester stage retort-house, which is admittedly charged by hand, the scoop or the shovel system is in vogue. It is probably the latter; in which case, much of the benefit of a stage house is lost. With regard to the machine houses, it is extremely gratifying to learn that, although the buildings themselves are well known to be of an obsolete style—low and cramped in comparison with newer houses for the same purpose—the stoking machinery greatly facilitated the work of gas making for the new hands. There is machinery, of course, in many of the South Metropolitan retort-houses—all, we believe, different varieties of the West principle; but the precise proportion of the machine to the hand-fed retorts has not been stated. Here, however, there is that combination of airy and commodious stage-houses with machine stoking which appears to be lacking in Manchester; and this may, in some degree, account for the greater rapidity of recovery in the gas production.

Of even more importance that our original comparison between stage and ground-floor retort-houses, and scoop and shovel charging, is the comparison thus suggested between hand and machine stoking. If it is true that the supposed greater simplicity of the old-fashioned way of charging retorts by the shovel has, as a matter of fact, broken down under the stress of strike conditions, while comparatively no difficulty has been experienced in working the apparently more complicated systems of mechanical stoking, one of the most familiar objections to the latter must be regarded as disposed of. Many a time a maker of retort-stoking machinery must have been discouraged by hearing from some very practical gas manager declarations against complicated "click-work," with all sorts of cocks and wheels to break down and get out of order; and expressions of perfect content with the old-fashioned way of the man with a shovel. What if the experience of the recent strikes shows that "the man with the shovel" is far more likely to "get out of order" than what he himself would call the "iron man," and more difficult to replace in an emergency? This would materially change the aspect of stoking machinery in the eyes of many gas managers.

If the machine-stoked retort-houses of the Manchester and Salford Corporations and the South Metropolitan Gas Company have, in this last ordeal, come out creditably to the makers, we desire to congratulate them upon the facts. Seeing that the strikers were so malevolent everywhere—doing all their limited intelligences prompted in the direction of stopping the production of gas—it is almost marvellous that they nowhere succeeded in crippling the machines, which one would imagine must be liable to be damaged by very little misdirected ingenuity. Both as pieces of mechanism, however, and also in principle, stoking machinery seems to have done remarkably well in the recent troubles; and but for its existence the supply of gas in the places where the strikers gave most trouble, would have been much worse than it was. What stoking machinery has done in the past is, however, nothing compared with what it will do in the future. The present and coming seasons will be the turning-point in the history of the supersession of hand stoking by mechanical and other appliances. No gas manager who has taken the lesson of the great strikes to heart, will feel justified in continuing to work at the mercy of a class of men who have shown themselves prone to forget every consideration of prudence, and to jeopardize the supply of light to the community at the bidding of unscrupulous agitators. The agitator will harangue in vain the iron man and the inclined retort, which will surely, from the coming summer, change the condition of the workmen in every large gas factory in the land. The necessity for making an alteration of system may not appeal very strongly to managers of small works, where about half-a-dozen men do all that is required; but the change will in time filter down even to these. It is the managers of the large gas-works who cannot afford to wait, and will move first.

The ascension-pipes have given a good deal of trouble at some works where new hands have been taken on, partly through the deliberate malice of the outgoing men, and partly in consequence of the conditions under which the retorts were worked by the new men during the first few days. Stopped ascension-pipes are a familiar plague of all gas managers; but when he has a strike on, the difficulty assumes horrible proportions. For days before the old hands left, they neglected to keep the ascension-pipes clean; and consequently the new men came into an inheritance of trouble. Even when they put the coal into the retorts it did not follow that any gas would reach the hydraulic main. Many retort-houses were quite illuminated for nights by those glares from the leaky lids which gas managers know so well and dislike so much to see. Light and long charges and hot retorts aggravated the mischief; and it was not until fresh gangs of pipe-jumpers could be organized, that the difficulty was in a measure overcome. The new hands in many cases found this work very trying. It is a melancholy comment on all that has been done to cure this evil, that at the present time the South Metropolitan Company and the Manchester Corporation should have suffered such inconvenience and loss from this old trouble of gas makers.

It is rumoured that the wear and tear of the retorts in some places where stoking machinery has been used throughout the strike has been very great, so that whole benches will have to be renewed next summer, long before their time. This will, of course, be a loss that could have been wished avoided; but, on the other hand, it will facilitate that wholesale alteration of plant that must come sooner or later, and the sooner the better. It will never do to put the same style and kind of work back again—possibly to be pulled to pieces once more in the event of a repetition of the recent agitation. It may be argued that this state of things is not likely to be soon repeated; but if it is to come again in ten, fifteen, or twenty years, it will be all too soon. The prudent engineer will shape his policy as though he were assured of a recrudescence of the Gas Workers' Union next winter, and will reflect that if he does not make the best use of the time for preparation, the enemy will. The gas manager who is caught napping twice will be unworthy of his position. Nobody could be blamed for not being prepared for a strike this winter; for it might have been thought that, with the highest rate of pay for their class of labour, and with employers having the means and will to grant any reasonable improvement in their conditions of work, gas stokers as a body would be the last to turn out on strike for an idea. The unexpected and improbable has happened, however. South London, Manchester, Salford, Bristol, and Woolwich Arsenal, have suffered strikes, and Norwich and Sydenham have been threatened with a like infliction. How near other places have been to the same trouble we can no more tell than the man who has escaped the prevailing epidemic can explain the reason for his immunity. The very variety of the places attacked demonstrates that, as with the influenza, stokers' strikes have been "in the air." What has happened may happen again; and next time North London, Liverpool, Glasgow, and Birmingham may be the sufferers, for what anybody can prove to the contrary. Wherefore we argue that, as a wise man ought to be able to profit by the experience of others, which comes cheaper than buying his own, the world of British gas engineering is on the verge of great changes, mechanical and otherwise, calculated to place the supply of light to the cities and towns of the United Kingdom above the risk of sudden suspension at the bidding of hare-brained and ignorant demagogues such as those who have done so much mischief during the present season.

The Salford Corporation and Mr. Ellis Lever.—The denial by the Town Clerk of Salford (Mr. S. Brown) of the statement of Mr. Ellis Lever's Solicitors (Messrs. Godfrey Rhodes and Evans) that the convict Hunter had requested his daughter to ask Mr. Lever to visit him in prison, as given in the JOURNAL last week, has been answered by them in a letter to the Manchester papers. They express surprise that Mr. Brown should make such a statement, as their client and Mr. Rhodes would, they say, never have troubled to see Hunter had it not been for such request. They have a distinct recollection of Hunter's confirming the request at the interview, as previously mentioned.

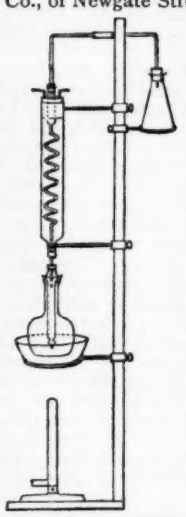
NOTES.

Improvements on Coze's System.

An improvement in inclined gas-retorts, after the pattern with which his name is now identified, has been patented by M. André Coze, of Rheims. This patent covers the form of the retorts, the method of connecting them to the charging mouthpieces, and the construction of the charging truck or waggon. The retorts are for the whole of their working portion of the peculiarly flattened Ω shape which M. Coze holds to be desirable for the proper distribution of the charge; but both ends, where they pass through the brickwork of the setting, are of contracted area. It is claimed that by this means the disengagement of the gases is greatly facilitated, while the coal is distributed in a regular manner throughout the retort, and choking of the upper end prevented. The charging mouthpieces are made with sockets to fit on the ends of the retorts; and the bends by which the inclined axis of the retort is changed into the vertical are made with duck-feet, in order to take their weight off the retorts. The alteration of the charging truck consists in making it carry as many tilting hoppers, provided with automatic closing gates at their lower ends, as may be required for use at one time. Thus, supposing a setting of three retorts to be in use—or, which amounts to the same thing, three retorts out of a large setting require to be charged at the same time—a truck would be made to take the three tipping shoots, and this would save time. The shoots are provided with means for checking the too rapid fall of coal, or of large lumps, which might otherwise choke the opening into the retort below. It is regarded as an essential feature of this combination that the retort, the charging mouthpiece, and the tilting hopper should together at the time of charging constitute a continuous passage for the distribution of the coal in the retort.

A New Apparatus for Testing Spent Oxide.

The accompanying illustration represents an improved apparatus designed by Mr. A. J. Bale, of Messrs. Bale, Baker, and Co., of Newgate Street, for the determination of the sulphur in spent oxide. Its object is to simplify the process of dissolving out the sulphur from a sample of spent oxide by washing with carbon bisulphide, at the same time avoiding the risks of error inherent in the ordinary method of conducting the operation. The whole apparatus is fixed on a stand as shown. The sample to be analyzed is enclosed in a test-tube of special construction, which is ground into the neck of a sulphur flask. The upper end of the tube is connected by a gas-tight plug with a spiral condenser enclosed in a water flask, and prolonged, if thought necessary, to a catch-flask shown on the right of the figure, which receives any bisulphide that may have escaped condensation. The operation of making a sulphur determination is conducted as follows:—The sulphur flask and oxide tube are weighed, and the weighed sample put into the latter. A sufficiency of bisulphide is then poured into the sulphur flask; care being taken that it does not reach to the bottom of the oxide tube, which ends in a small hole. The tube connections being then made, and heat applied through the water bath to the sulphur flask, evaporation of the bisulphide takes place. The vapour enters the upper part of the test-tube through the small hole shown in the drawing, and passes up into the condenser, where it is liquefied, and runs down in drops upon the sample in the tube. In due course the sulphur is washed out of the sample into the flask below; the process being continuous. After a time the bisulphide is seen to pass the tube perfectly clean, which indicates that the sulphur has all been washed out of it and remains in the flask. It then only remains for the bisulphide to be evaporated off in the usual way, and the sulphur and residual oxide dried and weighed in the ordinary manner. The convenience of this method of conducting the operation of dissolving out sulphur from spent oxide, as compared with that of using a great excess of solvent, is obvious; and it is claimed that Mr. Bale's apparatus is so easily managed, and so free from offence in working, that it can be used in an ordinary room.



The Duty of Coke-Fired Water-Tube Boilers.

Some interesting investigations have been made as to the duty performed by the electric lighting machinery of the Imperial Continental Gas Association in Vienna using their ordinary gas coke as fuel. The plant comprises eight Babcock and Wilcox water-tube boilers, and seventeen Willan's compound engines, driving directly an equal number of Crompton dynamos. The boilers are designed to work at a pressure of 147 lbs. per square inch, and two were tested on the occasion in question by Messrs. Ehrendorfer and Melhuish. The coke consumed, the water used in the ashpan and the feed, the boiler pressures, and the composition of the smoke gases were all observed (the latter by Schwackhofer's apparatus); and the cinders and ashes were carefully weighed. For a six hours' trial, the determined evaporative duty was 10·05 lbs. of water per pound of coke; the mean steam pressure being kept up to 143·3 lbs. per square inch. The mean temperature of the feed water was 185° Fahr. The coke used showed a percentage of 8·26 of ashes and cinder, and had a calorific value per pound of 13,186·98 British thermal units. The mean temperature of the waste gases was 527°; and 22·39 lbs. of air were supplied per pound of combustible. The performance of the boilers was as follows:—

Heat carried off by smoke gases	15·47	per cent.
„ lost by imperfect combustion	0·88	„
„ „ conduction and radiation (difference)	4·44	„
„ communicated to water	79·21	„

This is one of the most instructive tests on record of water-tube boilers and coke fuel.

A Measure of the Tautness of Ropes.

M. de Longraire has presented to the French Society of Civil Engineers a memorandum on the subject of the tautness of ropes. This is a matter that has been discussed in technical circles for a hundred years without the discovery of any rigorous theory respecting the observed facts. The author reviews the labours of his predecessors in the same field, and concludes to adopt three simple expressions for the tautness of ropes as functions of the diameter of the pulley, the tension, and the weight per current metre. The author's definition of tautness in this case is as follows:—When over a pulley moveable on its axis, or on a cylinder rolling on a plane, there passes a cord strained at its two ends by a resistance T and a power T^1, experience shows that, whether during uniform movement or on the instant of starting, the power T^1 is superior to the resistance T by a quantity which exceeds the friction of the pulley on its spindle, or the resistance of the rolling cylinder. This difference is the tautness of the rope. M. de Longraire discusses the experiments of Coulomb and others which led to the construction of the formulæ ordinarily employed; and after a critical examination, concludes that everything requires to be settled anew, in view of the fresh applications of rope gearing that crop up every day. For practical use the author indicates the three following formulæ, applicable to the different kinds of ropes employed for industrial purposes—designing by S, the intensity of the tautness in kilos; by D, the diameter in metres of the pulley or drum; by p, the weight in kilos of the rope per lineal metre; and by T, its tension in kilos:—For hemp, $S = 0{\cdot}04\ T \frac{p}{D}$; for iron, $S = (2 + 0{\cdot}0032\ T) \frac{p}{D}$; for steel, $S = (3{\cdot}5 + 0{\cdot}0032\ T) \frac{p}{D}$. Further research into this subject is considered desirable.

The "Practical Engineer" Pocket Book and Diary, issued by the Technical Publishing Company of Manchester, contains a collection of the best rules and formulæ ordinarily required by engineers, draughtsmen, mechanics, and manufacturers in their daily work. The notes on the various subjects dealt with have been specially prepared for the book; and they include a short account of gas-engine practice.

The Electric Lighting Projects for London.—At the meeting of the Commissioners of Sewers of the City of London last Tuesday, applications were received from the London Electric Supply Corporation and the Metropolitan Electric Supply Company for the consent of the Commission to their applications for Provisional Orders under the Electric Lighting Acts. Mr. Rose-Innes moved that the applications lie upon the table; and he urged the Commission not to give out of their own hands the power of supplying electric lighting in the City. After a discussion, the motion was adopted. It is reported that the first-named Company have abandoned their proposed Order for powers to light the parish of Paddington; thus leaving the Draft Order deposited by the House-to-House Company for the lighting of that parish unopposed so far as they are concerned. They have also, it is stated, abandoned their projects for the lighting of the districts of the St. Giles's and Strand District Boards of Works.

Death of Mr. Craig-Sellar, M.P.—We regret to have to record the death last Thursday morning, after a long illness, of Mr. Alexander Craig-Sellar, the Liberal Unionist member for the Partick Division of Lanarkshire, whose name will be familiar to our readers in connection with the movement initiated by him for the reform of legislation in connection with Private Bills. Mr. Craig-Sellar was a member of the Scottish Bar; and the training and practice in legal matters necessarily accompanying this position eminently qualified him for taking the prominent place he attained in the House of Commons. Although a fluent and ready speaker, it was as a worker that he chiefly distinguished himself. With regard to the special matter which occupied his attention during the last few years of his life, and which has been fully noticed from time to time in our columns, it may be briefly described as a scheme for abolishing the existing method of legislation by Committees of the House, and the establishment of some system similar to that of the recently created Railway Commission. In this connection the Government were prepared last session to bring in a measure dealing with one part of this scheme—namely, the consideration of all Private Bills affecting Scotland in the localities to which they referred; but the measure was crowded out. Mr. Craig-Sellar was in his 55th year, and he has left a widow and family.

COMMUNICATED ARTICLE.

THE CHEMISTRY OF ILLUMINATING GAS.

By Norton H. Humphrys, Assoc. M. Inst. C.E., F.C.S.

XXXVII.

The most useful information on oil gas for practical men is that furnished by descriptions of apparatus as erected and in actual use. A paper contributed by Mr. G. M. Hunter to the Institution of Engineers and Shipbuilders in Scotland* includes a description of an oil-gas works erected on Ailsa Crag for the supply of the lighthouse, and gas-engines used for working fog-signals. The gas-works buildings comprise a retort-house, and an oil-store, with a water-tank, which forms part of the roof. The oil-store contains 40 cisterns, each of 95 gallons capacity, having through outlet-cocks let into a pipe on the floor-line which leads to a tank of 280 gallons capacity, the top of which is level with the floor. From this tank the oil is pumped up into a large overhead tank as required. The retort-houses contain three beds of four retorts each. A washer and an ordinary upright condenser, comprising two rows of eight pipes in eaeh, arc provided, but no purifiers; and there are two gasholders, each capable of containing 10,500 cubic feet. The retorts are Keith's patent, and are made of cast iron. In cross section they resemble an inverted U; this shape being selected with a view of affording a large internal surface for the gas, and at the same time allowing them to be set closely together. There is a V-shaped depression in the top of each retort, which is intended to augment and complete the conversion of the oil into gas by acting as a baffle to receive the jet of oil and to deflect it on to the bottom of the retort. They are set over the furnace, with a solid flat bottom of brickwork to protect them from the direct heat. The setting is built of fire-brick in the usual manner; and there are cleaning-doors at each end of the retorts. Coal is used as fuel in the furnaces. Crude mineral oil, or blue paraffin oil, are used as the gas-making material; and each retort is capable of producing 290 cubic feet of gas, of 50 to 60 candle power, per hour, or an aggregate of 3500 feet if the whole are at work.

The oil is supplied to the retorts by means of tubes communicating with the overhead cisterns, and syphon tubes at one end of each retort. There is an inclined gutter inside, for delivering the fluid fairly into the hot part of the retort; and it is admitted in a thin continuous stream. If an excessive quantity of carbon accumulates in the retorts, the temperature is too high; and the presence of tarry matters indicates too low a temperature. The proper working is obtained when only a small deposit of carbon takes place; and this is secured by maintaining a cherry-red, verging on a white, heat.

A paper by Mr. Arthur Ayres on "Compressed Oil Gas and its Applications," read before the Institution of Civil Engineers,† includes a description of the works erected at the South Foreland for experiments on lighthouse illuminants and for the supply of gas buoys and beacons. They embrace a retort-house, purifier and meter house, gasholder, and engine-house. There are two furnaces, each fitted with two double retorts; also a hydraulic main, condenser, washer, and lime purifier. A set of pressure-gauges connected with various parts of the apparatus is fixed in the retort-house. The oil is stored in an underground tank outside the buildings, and pumped into a small cistern on the top of the retort-bench as required by means of a hand-pump. Pipes are led from this cistern to the funnels and syphon tubes fitted on the retorts; the rate of supply being regulated by means of micrometer cocks. On entering the retort, the oil is received in a sheet-iron tray extending nearly the whole length; and after passing along the lower retort, it is changed into a dense yellow vapour. The tar from the hydraulic main may be tested with a view of ascertaining whether the oil is properly treated. A drop is placed on a piece of white paper; and if a strongly-marked greasy border makes its appearance, the gasification is not complete. To remedy this, the supply of oil must be reduced, or else the heat of the retorts must be increased. When the oil and heat are properly adjusted, no greasy mark will be noticeable. The condenser is simply a closed cylinder 8 feet high by 2 ft. 4 in. in diameter; and the purifier is also a cylinder 3 feet in diameter by 2½ feet deep. The lower part forms the washer, and above this are two perforated trays for lime. The capacity of the gasholder is 1800 cubic feet.

Constant and careful attention is necessary to the maintenance of the heats, the regulation of the oil supply, and also to the pressure-gauges. When everything is in proper order, the pressure should not exceed 6 inches at the retorts; and the rate of production should be 6½ to 7 cubic feet per minute (from the four retorts). About six hours are required for heating up the retorts; and the quality of the gas produced is said to depend more upon the temperature of the retorts than upon the quality of the oil. The yield ranges from 70 to 90 cubic feet of gas per gallon of oil, the quality being from 40 to 50 candles; and the tar represents rather more than one-third of the original quantity of oil. The effect of compressing the gas to ten atmospheres is a depreciation in illuminating power to the extent of 20 per cent., and the deposition of about a gallon of hydrocarbon fluid per 1000 cubic feet of gas.

Some reference is also made to Pope's system of oil gas manufacture, as adopted by the London and North-Western Railway Company. In this system, double cast-iron retorts are used, 6 inches in diameter. The oil is delivered in a fine spray upon the floor of the lower retort; and after traversing this vessel, returns along the upper retort to the hydraulic main. The other details resemble those already described, except that a scrubber is used instead of a condenser and washer, and the lime purifier is dispensed with. Several statistics as to the cost of oil gas, as shown by the returns of railway companies who use it for lighting carriages, &c., were given. From these it appears that the actual cost of the gas as delivered at the burners ranges from 8s. to 13s. per 1000 cubic feet, according to the local price of oil, receipts for residuals, &c. The average yield of gas per gallon of oil ranges from 72 to 81 cubic feet.

In the course of the subsequent discussion, Mr. J. Tomlinson said that, as the result of several years' working, the yield of gas on the Pintsch system was 81 to 83 cubic feet per gallon, and the quality 51 candles. Compression to 150 lbs. per square inch reduced this to 38 candles, and caused the deposition of a gallon of hydrocarbon per 1000 cubic feet. Mr. James Keith said that the apparatus bearing his name was designed to obtain a maximum yield of gas with a minimum quantity of fuel, and a cool and permanent gas that might be used as fast as it was made without leaving any deposit. His original single-retort apparatus with one fire, making 200 cubic feet of gas per hour, could be heated from the cold in from 1 to 1½ hours, and the more recent four-retort apparatus, making 1000 cubic feet of gas per hour, could be heated up in three or four hours, and the quantity of fuel consumed was much less than in a coal-gas apparatus. His system was decidedly different from that of other makers, as he believed in rapid making, thorough washing, and quick and effective atmospheric cooling. The quality of the oil was an important point; and he had used a thickish blue oil that, when worked under similar circumstances of temperature, &c., gave 50 per cent. more gas of equal quality per gallon than paraffin oil. Mr. Ingrey criticized the cost of the oil-gas works; and he exhibited a small and cheap machine on the air-gas principle. This drew from Professor Foster some remarks on air gas as compared with oil gas. He said that the vapours obtained at ordinary or low temperatures showed a very high carbon density, but that their illuminating value did not increase in proportion. The gas obtained by the Pintsch and similar systems was as high, if not higher, in value, though its carbon density was lower. Therefore it did not require so much air for combustion, or give off so much carbonic acid. By the action of heat in the destructive distillation of oil, unsaturated hydrocarbons were obtained, possessing great illuminating power. In the low-temperature gas, the illuminants existed largely as paraffins; and these, submitted to higher temperatures, could be made to yield unsaturated hydrocarbons of high quality. So it was a question whether greater illuminating value was not obtained by the action of heat. The air gas could scarcely be called a gas, as it consisted merely of petroleum vapours diffused into air; and he thought it would prove expensive in working, as requiring large proportions of vapour to produce anything like a high illuminating power. Mr. Harland had worked a small oil-gas plant abroad, and experienced difficulty in the wear and tear of the retorts, due to the dropping of the oil. The retorts speedily became pitted at the point where the oil fell in; a hole was eaten through in a short time, and the retort quickly spoiled. Mr. Rickman said that the use for gas making of hydrocarbons flashing at low temperatures was objectionable and dangerous for many reasons. Mr. C. E. Botley said that both the quality and quantity of the gas were affected by the temperature at which it was distilled; and every oil required a different treatment to obtain the best results. If only the actual consumption of oil in the retort was quoted, it would give too high a result, as in actual working there was a loss of about 6 lbs. per cask, due to absorption, leakage from the tanks, loss in pumping, &c. In practice he found that the yield of gas was about 75 cubic feet per gallon of oil; and the quality, after compression, from 36½ to 45 candles. The cost with oil ranging from 3·8d. to 6d. per gallon was from 4s. 5d. to 6s. 9d. per 1000 cubic feet; and after efficient condensation and scrubbing, he did not consider that the gas required purification. Mr. H. Leicester Greville had found that oil gas could be readily made on an experimental scale by allowing the oil to flow down a wrought-iron tube carried through the lid, and extending to within 6 inches of the back of the retort. The oil was vaporized in the tube; and the vapour was decomposed in returning towards the ascension-pipe. The best temperature was that usual in gas-works. Employing ordinary American petroleum, he had obtained 90 cubic feet of 50-candle gas per gallon; and the quality was improved by the use of a little water or steam. The quality and quantity of the gas obtained depended on the temperature of the retort and the rate at which the oil was supplied; and the best results followed the least back pressure in the retort. Mr. G. M. Hunter said a purifier was necessary with oil gas, as it contained varying quantities of sulphur compounds and of carbonic acid. He objected to the plan of allowing the oil to enter the hollow retort, and the gas to pass out through the colder one, as the gas could not be

*See JOURNAL, Vol. XLIX., p. 859.

† See JOURNAL, Vol. LI., p. 686; and Vol. LII., p. 463.

benefited by going through the colder retort. Mr. F. J. Rowan said that in the Rogers system the oil was injected into retorts by steam-jets; and the steam prevented the deposition of carbon. A much higher yield was thus obtained than those above mentioned.

For further particulars of oil-gas apparatus, the reader may be referred to a detailed description of the Pintsch apparatus as in use at the Clapham Junction station of the South-Western Railway Company,* and also to a paper read by Mr. G. M. Hunter before the Institution of Civil Engineers.†

TECHNICAL RECORD.

GADD AND MASON'S SPIRAL-GUIDED GASHOLDER AT NORTHWICH.

There was a large attendance of gas and other engineers at Northwich on Saturday afternoon last, to witness the formal inauguration of the first gasholder erected without external upper guide-framing. A majority of the gentlemen present are members of the Manchester District Institution of Gas Engineers; but there were also visitors from other districts, and the gathering was fairly representative of the profession in most parts of the country. The new holder which has been put up to supplement the storeage accommodation at the works of the Northwich Gas Company is constructed in accordance with the plan invented by Mr. W. Gadd, of Manchester, and patented by that gentleman and Mr. W. F. Mason. It is rather less than eighteen months since the invention was communicated to the public, in a paper read by Mr. Thomas Newbigging before the members of the Manchester District Institution at their Doncaster meeting in 1888.‡ Mr. Newbigging then described it as follows:—"The invention consists in placing the channel or other guides within the tank at an angle, like the thread of a screw, instead of in the vertical plane, as has hitherto been the invariable practice. The guide-rollers attached to the bottom curb of the holder are ranged either radially or tangentially with the sides of the vessel; and as they work in the channel or rail guides provided for them, a helical or screw-like motion is communicated to the floating vessel as it rises or descends in the tank." It was claimed in the paper that the guides thus constructed "answer not merely the purpose of guiding the vessel in its rise and fall, but also serve as cramps or grips; withstanding, by their locking power, whatever strain may be exerted against the holder, whether laterally on the sides or perpendicularly upon the roof." So much for the anticipation; now as to the realization. The holder which the Northwich Gas Company have constructed upon the advice of their Manager (Mr. S. S. Mellor) has two lifts. A few particulars as to its dimensions have been already published; but it will not be out of place to re-state and supplement them. The holder, then, has a capacity of 109,000 cubic feet. The diameter of the bottom lift is 60 feet; that of the inner lift, 58 feet. The depth of each lift being 20 feet, there is a total height of 40 feet from the water-level. As compared with the diameter, the height is unusually great; and this, of course, makes the test more than ordinarily severe, and the success of the experiment more marked than it would have been had the proportion of the height to the diameter been something less than two-thirds. The sheets of which the holder is built are no stronger than usual; those of the main body of the structure being of 14 B.W.G., and of the bottom row 12 B.W.G. Allowing for the absence of the upper framing, there is little difference to be seen between the new holder and one of the ordinary character. The most striking is perhaps the presence of strong vertical ribs on the outer side of the lower lift. This departure from the usual plan of placing the stays inside the holder has been rendered necessary by the fact that space is required in the bottom lift for the angular guide channels; while the ironwork has been strengthened in this and some cases to guard against the risk of accident in this excursion into the region of the unknown. Mr. Newbigging, however, holds that the employment of stronger stays and heavier trussing is not really necessary, and explains that he provided for it in his plans merely as a measure of precaution, because it was a new departure. In the upper lift the vertical stays are of the ordinary character; and, of course, are inside. The cup and grip are constructed in the usual way; but the bottom curb is stronger, and is formed of channel-iron outside the floating vessel. As to the rollers, which play so important a part in the guiding and stability of the holder, a little information will be of interest. They are of steel, and are secured to carriages of cast iron of unusual strength; these being in turn bolted to the bottom curb. The outer rollers are grooved, and work on the edge of the table of the rail; while the inner ones work within the channel of the rail. The guides are also of steel, and both within the tank and against the bottom lift are at an angle of 45°. No difference is made in the tank except that the piers are dispensed with—a by no means unimportant fact in point of cost. Opinions will differ as to the appearance of a holder robbed of all the superstructure, on which it has been customary to lavish more or less of architectural and artistic embellishment. Possibly some will not appreciate the unadorned style of the new kind of erection, with its lifts rising one above the other, and with no more of ornamentation than is furnished by a simple railing round the top. On the other hand, there may be those who will agree with Mr. Gadd that there is in this unadorned beauty "something of the simplicity of the pyramids of Egypt."

Saturday's ceremony calls for little description. When the bulk of the visitors arrived, they found the holder already fully inflated—a striking object to the professional eye, because of the unusual appearance to which reference has been already made. After an interval, in which time was not only found for a thorough examination of the holder as it stood, and for the asking of questions, a photograph was taken of the structure with the visitors grouped in front of it. Then Mr. G. B. Cliff, the Chairman of the Northwich Gas Company, turned the outlet-valve; and, the gas flowing into another holder on the works, the new holder began to descend. The operation was watched with much interest. As already explained, the vessel has a screw-like motion in falling or rising; but on this occasion at least it went as smoothly and steadily as though the fall were in a perfectly vertical direction; and it was only by careful watching that the unusual motion could be detected. The descent continued until the upper lift was uncupped, and then practically ceased; the new and old holders being at this point about equally balanced. The gauge fixed over the inlet-valve indicated a steady pressure of 7 inches, and showed a variation of little less than one-tenth between going up and coming down. Unfortunately, no information was forthcoming as to the local wind pressure. The holder has, however, withstood, without the slightest sign of weakness, the somewhat rough and variable winds of the past two or three weeks. On the night before the inauguration, there was, at least, a moderate gale blowing; and an indication of its force was furnished in the fact that a portion of the coping and some of the brickwork of the chimney at the gas-works were dislodged and fell in the yard. The new structure may therefore be said to have stood a rather severe test already.

At the conclusion of the simple ceremony at the works, the visitors adjourned to the local Drill Hall, where dinner was served. Mr. W. F. Mason presided. Letters of apology were read from several gentlemen who were unable to be present, including Mr. A. Phillips, C.E., of Westminster; Mr. F. S. Cripps, of Sutton, Surrey; Mr. John Somerville, of the South Metropolitan Gas Company; Mr. M'Kenzie, President of the North British Association of Gas Managers; Mr. J. Timmins, of Wigan; and Mr. W. A. Valon, of Ramsgate.

The Chairman, in proposing the health of the Directors of the Northwich Gas Company, said he looked upon that as a red letter day in the history of gas manufacture, because they had inaugurated a system of gasholder construction which, he believed, would be the system of the future. There had not been the slightest hitch during the whole construction of the holder. The contractors took somewhat longer than was expected; but, considering everything, they had done very well, He acknowledged very gratefully the ability displayed by Mr Newbigging in designing and superintending the carrying out of the works, and also complimented Mr. Leicester, the representative of Messrs. Clayton, Sons, and Co., the contractors. When new departures were made, there were always difficulties to overcome; but, under the able guidance of Mr. Newbigging, they had had no drawbacks from first to last. Many were possibly struck by their audacity in selecting a place like Northwich for their first trial; but he was glad of it, because, having overcome the difficuties there, and put the new invention to so severe a test as arose from a holder whose height was two-thirds of its diameter, he thought the sceptical could have very little to say in future. In conclusion, he congratulated the local Directors and their Engineer (Mr. Mellor) on the courage they had displayed in adopting the invention, and being the pioneers of a new system of gasholder construction.

Mr. Cliff replied to the toast, and proposed the health of Mr. Gadd.

Mr. Gadd remarked that it was with some degree of satisfaction that one saw one's idea put into proper shape. He had been pleased with the way in which Mr. Newbigging had designed and carried out the work, and also with the manner in which he was ably seconded and supported by Mr. Mellor—a gentleman who, he believed, was destined to rise in his profession. With regard to the stability of the holder—which was one of the first things that would arise in the mind of an engineer—he had never had the slightest dream of fear. He had very great faith in mathematics. It was an old saying that "mathematics cannot lie." They could not, if properly used. He had investigated the mathematical problems connected with the gasholder very carefully during the construction of the holder and before; and the result he had arrived at was this: The strongest gale that could probably be imagined, exerting a force of 50 lbs. to the square foot (and such a gale was very unlikely in this country), would only have a lifting power, if distributed over half the holder, of 5 tons. Hence a weight of 5 tons would keep the holder down. Now, the weight of the bell was 50 tons; and as half of this was 25 tons, there was actually a margin of 20 tons over and above the greatest wind pressure they could imagine acting to turn the holder over. It might be said: "Yes, but the holder is a floating vessel." So it was; but it was under

* See JOURNAL, Vol. LI., p. 726. † *Ibid.*, Vol. LIII., p. 1131.
‡ *Ibid.*, Vol. LII., p. 373.

entirely different conditions from those they had been accustomed to. Every holder must be a floating vessel; but it was one thing to be a free floating vessel and another thing to be a gripped floating vessel. A hat held upon a stick was in the same condition of stability as an ordinary holder; and the least power exerted at the bottom edge of the rim, would tip it on one side. It was in a state of what might be called perfect equilibrium; and having no self-righting qualities, it had a tendency, by the action of gravity, to "turn turtle." But if the hat was raised on a stick, and a number of points supporting it placed all round the brim, the tendency to tip over was gone. In a holder on the principle he had invented, it was quite immaterial where the centre of gravity was. It did not, so far as the holder was concerned, matter whether it was true or not; all it did was that it affected the total gravity of the holder, or, in other words, determined the pressure upon the gas. Two inches of immersion represented something like 7 or 8 tons; so that if they took away all the under rails, and there was nothing to keep the holder down but its weight, as it rested upon the top rails, it was impossible for it to be blown over. The most that could be done would be for the gale to lift it on one side 2 inches or perhaps 1½ inches, because every 2 inches represented 7 or 8 tons. The holder might make a little cant to one side; but it would come back, because the other side had no tendency to go down. To make it go over, it would have to be lifted up bodily; and this could not be done unless there was a wind force capable of vertically lifting 25 or 26 tons, or whatever might be half the weight of the bell. He had, therefore, not the slightest fear of its being blown over, even if they took off all the under guide-rails. Another question which had been raised in the JOURNAL OF GAS LIGHTING was as to the action of the wind locally upon any part of the holder with regard to distortion. This was a question which, from a mathematical point of view, was rather overrated. Although they had a very thin holder, it must be remembered that there was always a pressure inside the holder which was greater than the pressure of the atmosphere outside. This converted the structure into the solid whole; and it must be stronger to resist local distortion than a building like that in which they were then assembled. The sides of the room might be distorted by being bulged in, because there was no resistance, except the top or bottom supports; but in a gasholder there was resistance from the fact that the pressure inside was always superior to that outside. Probably the idea of local distortion had been somewhat exaggerated in the past; but to avoid any possibility of accident of that kind, the holder had been strengthened, and was, he believed, three times as strong as it need be. Still, it was well to err on the right side. They had put the upright stays of the outer lift outside. This was more a matter of convenience, because they were the guide-rails for the upper lift inside; but to give additional strength against local distortion, they broadened out the upright stays as they came to the lower part of them. He believed it would require very great force indeed—hydraulic force, or something of that kind, concentrated at one point—to bring about even local distortion. In a heavy gusty gale, when the wind came in rushes, and dealt sledge-hammer-like blows against an ordinary holder, there was a constant knocking against the columns on the other side. If these columns were of cast iron, the result was sometimes disastrous. A rod of glass supported at either end would bear the strain of a considerable weight, while the blow of a knife, representing less than one-twentieth of the weight previously borne, would smash it. His opinion was that the broken columns of gasholder framing were caused rather by sudden gusts of wind than by the pressure of so many pounds to the square foot. Gas engineers had thus been driven to go in for wrought-iron columns; and he trusted that the necessity for these and all other framing would very soon disappear. Gusty winds would have no effect upon the holder erected without framing. When a blast caught this huge cantilever—for it was really a cantilever—on one side, there was nothing on the other for it to strike. The inherent elasticity of the structure would preserve it from damage; and its bottom curb being always rigid, it was as stable as a whip or a reed shaken by the wind. There was absolutely nothing to fear. As he said, when introducing the matter at Doncaster, if the thing was not right "it could not live;" and he should like to add now that if it was right it was compelled to command their attention.

Mr. T. Newbigging also responded to the toast of his health. He said the credit which was due to him in the successful completion of this, the first holder of its kind, was only of a secondary character, as, in justice to Mr. Gadd, he must say that his share of the work had only been to put the idea into practical shape. Still even the small service he had rendered had been an anxious one, because, much as one must have confidence in a principle, when it came to applying that principle in daily practice there were naturally some misgivings as to the way in which the ideas of the inventor might have been carried out. The Chairman and Directors of the Gas Company and their Manager exhibited an intelligent appreciation of the invention, and deserved credit for their resolution to put it to this test; and praise was justly due to the contractors, Messrs. Clayton, Son, and Co., for the manner in which they had carried out the details of construction. As to the holder itself, it would be generally admitted that, in applying the principle to a two-lift holder, each lift being 20 feet deep, and having a diameter of only 60 feet, the test to which the invention had been put was about as severe and exacting as could well be employed. It was evident that, with a larger proportionate diameter in the floating vessel, as compared with its depth, the stability of the structure must also be proportionately greater. The holder had also been tested in another way. During the fortnight of its inflation, they had fortunately had several rather strong gales of wind; and though these could not be said to have attained the force of a hurricane, they had been, especially on the 4th and 5th inst., of such a strength as to apply a very severe test to the structure. This was highly comforting to some of them, because, although they might interest themselves in mathematics, they could not have a superabundant satisfaction in resting their belief entirely on mathematics. With the experience they had had in carrying out the design, he felt satisfied that little or no additional strength was required beyond what obtained in holders as ordinarily guided, and that with carefully adjusted rollers of suitable strength, and the tank rails properly secured, the conditions of safety in the new invention were as great as, or greater than in the older arrangement. In conclusion, Mr. Newbigging expressed pleasure at seeing some of their outside friends amongst them; and he proposed the health of these "comparative strangers."

Mr. Henry Woodall, in responding, objected to being included amongst the "strangers," seeing that he was one of the oldest members of the Manchester District Institution. He then alluded to the steps which are being taken to form a North Wales District Institution; and proceeding to refer to the immediate cause of the present gathering, said he had watched the invention with the keenest interest from the commencement, and had had the greatest confidence in it. His experience had led him to believe that they had valued gasholder framing too highly; and he was glad to hear the admission made that the strength of this holder was three times what it need be. It really took very little to support a gasholder. Of all the accidents which befell gasholders, two out of three were due to the supports. Going through the whole of his experience, he might say that, in every instance in which he had known of injury to a gasholder, it was due to the framing. At Clayton, some years ago, a girder got out of position, and became a lever which smashed the whole structure. After this he examined the framing of the holders at Leeds; and there he found that the bolts, which attached the girders, had been worn by friction throughout a number of years, until some were absolutely worn through, and others were worn down to ⅛ inch or ¼ inch. The result of such wearing away as this was that the girders could not fall back into the same rigid position as before, and little by little they shifted, until some day there came a wind and they toppled over. He therefore thought Mr. Gadd was perfectly right in saying that, unless they could have absolute rigidity in the columns, they had better be without them altogether. He (Mr. Woodall) augured nothing but success for this invention. Perhaps the new structure did not look quite so architectural as the old; but probably they would come to regard the upper framing as superfluous. They looked upon Mr. Gadd as a true inventor, and would always entertain very high interest for one who had introduced something which would live, and by which they would all profit.

The remaining toasts were "The Health of Mr. Mellor," "The Contractors" (for whom Mr. Leicester responded), "The Press," and "The Chairman."

In proposing the last-named toast, Mr. T. Duxbury, of Darwen, said, after all, the question which would have great weight was that of pounds, shillings, and pence. If they were going to save much by this invention, no doubt they would take advantage of it; and he was sure those interested would not be backward in giving them calculations which would enable them to base estimates for the future extension of their works from time to time.

More Electric Light Accidents.—Two explosions were caused last Wednesday evening by the electric wires running beneath the roadway in Sixth Avenue, New York; and at Hartford a factory operative was killed by grasping an electric light wire.

New Water-Works for Amsterdam.—The summer season of 1889 was remarkable in the Dutch capital for its dearth of water for domestic purposes. This water is brought into the town from the dunes around Haarlem, by a Company, who, partly with English capital, started in 1855, and have been extending their reservoirs and mains ever since, in order to keep pace with the wants of a city the inhabitants of which have doubled in the last 25 or 30 years. The Company have a monopoly, in virtue of an exclusive concession; but their charter is very stringent, and, when the water supply failed in the summer, and no satisfactory explanation could be given, a committee of experts was appointed to make inquiry and report to the authorities. The Committee have just issued their report. They find, says *Industries*, that the Company have not complied with the terms of their charter; that the collecting of water in the dune is defective, because the pipes are not laid at a level to ensure the proper interception of all the available water; and, further, that the conduits between the dunes and Amsterdam are insufficient to carry all the water required, and that the proper supply has been kept down by the Company having a low pressure in the dunes. The Committee propose certain provisional measures, which will cost some £15,000, and tend to increase the supply to the city.

MANCHESTER ASSOCIATION OF ENGINEERS.

Mr. John West on Gas and Electricity.

At the Meeting of the above-named Association on the 11th inst., Mr. John West, M. Inst. C.E., the President, delivered his Inaugural Address, a large portion of which, as briefly noticed in the JOURNAL last week, was devoted to a consideration of the relative merits of gas and electricity as illuminating agents.

Having referred to the gradual advance made in electric lighting from the time of the display at the Paris Exhibition of 1878, and subsequently in conjuction with gas, at the Crystal Palace, in 1882-3, the President noticed the first legislation in regard to the new system of illumination—the passing of the Electric Lighting Act of 1882—and the important amendment lately made therein by the extension of the time which must elapse before undertakings can be acquired by local authorities, and the modification of the terms under which the transfer is to be made. These alterations, he pointed out, had encouraged electric lighting, and companies had sprung up in London and the provinces to lay down plant for supplying the light. In some cases, where the gas-works belong to the municipalities, they themselves had obtained powers to supply the electric light as well as gas. Ten companies had been formed for lighting London, with a united capital of more than £3,000,000 sterling. The systems under which electricity is supplied by these companies—viz., the direct continuous current and storeage, and the alternating transformer systems—were next described; and credit was given to electrical and mechanical engineers for having produced some very superior steam and gas engines and dynamos, and generally improving the plant, so as to ensure steadiness of light. The charges, Mr. West stated, were 7d. to 8d. per Board of Trade unit of 1000 watts; and he added that some companies would not furnish a supply to a consumer under a minimum charge of £14 per annum.

While admitting that electricians had made some progress in perfecting machinery for securing a better and more regular supply of electricity, the President said it must not be forgotten that improved lighting by gas had also made very rapid strides. He mentioned that 13 years previously he read a paper before a Philosophical Society upon the "Economic Consumption of Gas;" and another during the year 1882, at the Smoke Abatement Exhibition in Manchester, where he displayed a number of defective burners that had been used by the consumers, and compared them with the more recent and improved burners then obtainable, when it was found that a great many consumers were not getting out of the gas anything like the illumination it would afford even with a good ordinary burner. Since that period, two new systems of burners had been perfected—those of the regenerative type, with which were associated the names of Siemens, Sugg, Wenham, Fourness, and others, and the incandescent burners of Welsbach, Clamond, and others. The burners, particular those of the regenerative kind, had come into general use, and from them a better light could be obtained with from one-half to one-third the quantity of gas. In support of this statement, the results of tests of the various kinds of burners referred to—made by Mr. A. Smith, of Aberdeen, and Messrs. W. Foster and C. J. Lambert—were given.

The President next proceeded to compare the relative cost of gas and electricity, with equal light from each. He pointed out that eminent electricians state that a 16-candle power incandescent lamp is calculated to last about 1000 hours, during which time it would absorb 60 Board of Trade units of electricity. The cost of this at 8d. per unit, would be 40s., to which must be added 3s. 9d. the cost of the lamp—making a total of 43s. 9d. per 60 units, or 16,000 candles. To make the comparison clear, he gave the cost of gas in London, Manchester, and Aberdeen to produce the same amount of light, both with ordinary and regenerator burners. The results are shown in the following table:—

—	Quality of Gas.	Consumption to Produce 16-Candle Power per Hour.	Consumption required for 1000 Hours.	Price per 1000 Cubic Feet.	Cost per 1000 Hours.	Number of Times Gas is Cheaper than Elect'y.
Ordinary Burners.	Cand.	Cub. Ft.	Cub. Ft.	s. d.	s. d.	
London . . .	16	5·00	5000	2 6	12 6	3·5
Manchester. .	20	4·00	4000	2 6	10 0	4·4
Aberdeen . .	28	2·88	2880	3 6	10 1	4·3
Regenerative Burners.						
London . . .	16	2·50	2500	2 6	6 3	7·0
Manchester. .	20	2·00	2000	2 6	5 0	8·7
Aberdeen . .	28	1·44	1440	3 6	5 0½	8·7

In reference to the preceding table, the President remarked that possibly he might be charged with having compared the electric light with both the best ordinary and regenerator burners. To this he could only reply that these burners were within the reach of all consumers, and that it would be to their great advantage to adopt them. He pointed out that he had compared the gas with an electric lamp assumed to give the same light throughout the 1000 hours; but this was not the case, as it was found that after they had been used for a time the carbon filament became volatilized and deposited on the glass, consequently the size of the filaments was diminished and the surface of illumination reduced—the carbon on the glass further reducing the light. These facts had been confirmed by the experiments of Mr. Preece, Chief Electrician to the Post Office, who stated that ordinary commercial lamps consuming 3·54 watts per candle power when new required 6·1 watts per candle power after burning 900 hours—the mean absorption being 5·25 watts per lamp. Stated the other way, it appeared that the candle power of the lamps after burning 900 hours was only 58·5 per cent. of the initial duty; and the mean value of a lamp during its life was only 67 per cent. of that which it posssesed when new. Assuming an average use of four hours per day for a lamp; this meant not only that all incandescent lamps must be renewed before 225 days (when their luminosity was little more than half what it was when new), but, taking all the lamps in an establishment together, three should be provided to do the work of two if the intended average lighting effect was to be maintained. The President said he was prepared to admit that the introduction of the electric light would be advantageous compared with gas consumed in ordinary burners, when a room was low-pitched, without any means of ventilation, and where a number of people were assembled assisting in the vitiation of the air. At the same time he was bound to say that by the adoption of regenerative gas-burners not only would the maximum illuminating power per cubic foot of gas be obtained, but the products of combustiou would be carried away without being permitted to enter the room, and the warm vitiated air would be removed as it rose to the ceiling. It appeared to him that some people preferred the electric light for reasons outside its advantages as a lighting agent—one because of its value as an advertisement, another because it was fashionable, and so on. But let the cause be what it might, he saw no reason why they should not have the electric light if they had a fancy for it, and were willing to bear the additional expense attending its adoption.

Mr. West then proceeded to give his views as to the cheapest and best way of producing and delivering electricity to the consumer under varying circumstances. He said he had been informed that in one town a complete electric lighting plant, driven by steam power, for the supply from a central station of 3000 incandescent lamps of 16-candle power, with cables laid along the streets, would cost about £20,000. Mr. J. Ferguson Bell, of Stafford, had stated that in his town it would cost £14,500 for a like installation without reckoning the cost of land. Then there was the plan of supplying oneself (provided the number of lights was sufficiently larger) by means of a complete plant, driven by a gas or a steam engine, on the consumer's own premises. He had been supplied with the cost of a complete electric installation, including fittings for 320 incandescent lamps of 16-candle power each, which had been working for about two years at one of the banks in London. The plant was driven by gas-engines; and the building being very dark, the lamps had to work for about 1800 hours per annum. The following were the figures supplied to him:—

Outlay on Plant.

	£	s.	d.
Two 9-horse power "Otto" gas-engines and fixing . .	650	0	0
Two dynamos	300	0	0
Two sets of accumulators	1250	0	0
Fitting up the bank throughout with wire, lamps, and all accessories, including architect's charges . . .	800	0	0
	£3000	0	0

Working Expenses.

	£	s.	d.
Gas used, 2,000,000 cubic feet, at 2s. 6d. per 1000 feet .	£222	0	0
Proportion of wages of attendant, who does other work	75	0	0
Oil, waste, and water	25	0	0
Repairs to engines and dynamos, and depreciation at 10 per cent.	95	0	0
Repairs to accumulators, and depreciation at 15 per cent.	187	10	0
Cost of renewals of incandescent lamps (each burning 1000 hours, at 3s. 9d. each)	108	0	0
	£712	10	0
Interest on capital, at 10 per cent.	300	0	0
	£1012	10	0

Current of electricity supplied, about 35,500 Board of Trade units.

Analyzing the foregoing figures, the President pointed out that the cost per Board of Trade unit for generating electricity, including wear and tear and interest on capital, was 5·58d.; interest on fittings, 0·56d.; renewal of lamps, 0·7d.—total, 6·84d. If the bank had obtained electricity from a company supplying from a central station at 8d. per unit, the total cost to them would have been as follows:—Electricity, 8d.; interest on fittings, 0·56d.; renewal of lamps, 0·7d.—total, 9·26d. So that by generating electricity on their own premises they saved 2·42d. per unit, or £357 19s. 2d. per annum. In this case, as shown by the accounts, accumulators were employed, so that the electricity could be generated during the daytime with smaller gas-engines than would otherwise be required; but the loss of efficiency by the use of accumulators was about 20 per cent., and was a great drawback. He thought it would be found in practice that the most economical and satisfactory way of producing and supplying electricity to the consumers would be by gas-engines on their own premises, or by a system of very small central stations, where a few houses or shops in close proximity could be worked by the direct system of distribution. By this plan it would be possible to avoid expensive outlay on buildings, and

at the same time to advantageously use the existing gas-mains, as well as dispense with the cost and maintenance of an electric meter on the premises. The cost of generating plant for 400 16-candle power incandescent lamps, burning 1800 hours per annum, on this plan of electric lighting by the use of gas-engines and dynamos on the consumers' premises (already fitted up with wires and lamps) would be as follows:—

Outlay on Plant.

One 20-horse power gas-engine, fixed complete	£500	0	0
Dynamo	260	0	0
Slides, disc-wheel bearing and fixing, switches and cables in house	140	0	0
Total	£900	0	0

Working Expenses.

Gas used, 2,160,000 cubic feet, at 2s. 6d. per 1000 feet	£270	0	0
Proportion of wages of attendant	75	0	0
Oil, waste, and water	35	0	0
Repairs to engine and dynamos, with depreciation at 10 per cent.	90	0	0
Proportion of rent, &c.	100	0	0
	£570	0	0
Interest on capital, at 10 per cent.	90	0	0
	£660	0	0

Current of electricity supplied, about 43,200 Board of Trade units.
Cost per unit of electricity, 3·66d.

In the case of an installation of direct generating plant for electric lighting by the use of gas-engines and dynamos on the consumer's premises (already fitted up with wires and lamps), to supply fifty 16-candle power incandescent lamps, burning for 1800 hours per annum, the cost would be as follows:—

Outlay on Plant.

One 4-horse power gas-engine, with dynamo, &c.	£275	0	0

Working Expenses.

Gas used, 270,000 cubic feet, at 2s. 6d. per 1000 feet	£33	15	0
Proportion of wages of attendant	18	4	0
Oil, waste, and water	8	0	0
Repairs	6	0	0
Depreciation	13	10	0
Rent	4	0	0
	£83	9	0
Interest on capital, at 10 per cent.	27	10	0
	£110	19	0

Current of electricity supplied, about 5400 Board of Trade units.
Cost per unit of electricity, 4·93d.

By this plan electricity could be supplied, as shown by these examples, at prices varying from 3·66d. to 4·93d. per Board of Trade unit, according to the size of the installation, inclusive of working expenses, repairs, depreciation, and interest on capital. The usual charge by the London electrical companies, whose supply is generated for extensive districts in large stations driven by steam power, is 8d. per unit; showing a saving of 4·34d. and 3·07d. per unit respectively in favour of the gas-engine scheme. To explain how the charge for working by gas was obtained, the President stated that he first took the quantity of gas required per indicated horse power per hour, at 20 cubic feet. With this quantity of gas a maximum of eight lamps of 16-candle power each could be maintained per hour; and by allowing a little extra for irregularities, and taking 50 cubic feet of gas to produce one Board of Trade unit, the gas would cost 1¼d., to which must be added the other figures in the table of working expenses.

Mr. West explained that the reason electricity could be distributed to consumers by gas-engines cheaper than from a large central station was because the very expensive cables for distributing the electricity (which in most cases take one-third of the capital employed) could be dispensed with, as also the further expenses for renewal after the cables had been in use for a time. It was stated that Mr. Edison's cables in Berlin only last three years. These cables cost £90,000 for 36,000 lamps of 16-candle power and 144 arc lamps. From these facts it was quite clear that the interest on the first cost and maintenance and renewal of distributing plant alone would be more than the cost of gas delivered on the consumer's premises from the existing mains. He expressed the opinion that the Corporation of Manchester were quite right in taking steps to obtain a Provisional Order from the Board of Trade for supplying the electric light, for which they could put up plant themselves, or employ other parties to supply them. They had excellent distributing plant for the purpose in the existing gas-mains, which, by the aid of gas-engines would supply a power available at any time, requiring no constant attention, and causing no nuisance from smoke. These engines were already extensively used; Messrs. Crossley Bros. having sold 550 for the purpose. Where the outlay on plant was an impediment, he advised corporations and gas companies to throw more enterprise into their undertakings, and provide and let out on hire gas-engines and dynamos in the same manner as they now let out cookers and gas-stoves. In some cases it might even be advisable to sell the gas at a cheaper rate for electric lighting and heating purposes.

The President said he had not referred much to the use of arc or incandescent electric lamps for public lighting, because it had been proved over and over again that these lights could not possibly compare with improved gas burners and lanterns either for cost or efficiency in lighting power. In many cases where arc lights of high power were employed on outdoor work, they had been superseded by the Lucigen and Wells portable lights. Before leaving this subject, he said it must not be forgotten that in nearly all cases both gas and electric light are obtained from the energy contained in coal, and that gas companies and corporations who own gas-works could produce as much light direct from the gas made from a ton of coal (if properly applied) as could be derived from a ton of coal by any other means, besides having the resulting coke, tar, and ammoniacal liquor to dispose of. Therefore, as far as he could judge, gas must remain by far the more economical of the two methods of lighting.

Mr. West concluded his address with an appropriate reference to water gas. He remarked that the subject of water gas had been brought very prominently before the public during the last year or two, more perhaps for the purpose of floating speculative companies than because of any real novelty in it; for at least 30 years had elapsed since it was new to English gas engineers. Many had been the trials of variations of the same principle, owing to the extreme simplicity of the apparatus and the large amount of work that could be done on a small area; but the question of ultimate economy had often prevented the success of schemes which were otherwise satisfactory. He explained that he was referring more particularly to the use of water gas for general lighting purposes, as there were many examples in England of its admirable qualities as a heating agent. Having described the method of generating the gas, he pointed out that there is a great difference between the circumstances of the production of water gas as a lighting agent in America and in England, inasmuch as in America the petroleum oil used to invest the gas with lighting properties is easily obtained at a very low price, and the price of coal gas is much higher than it is in this country. A greater margin thus exists between the two kinds of gas. As a heating agent water gas was, he said, very valuable where a high flame-temperature was desirable; as the theoretical temperature was about 5000° Fahr., while that of coal gas was about 2500° Fahr. He went on to show that mistaken notions are frequently held by persons not specially interested in the question, though of thoroughly scientific education, as regards the heating value of ordinary coal gas compared with the so-called "heating gas." He said the fact was that, roughly speaking, the better the lighting qualities of a gas the greater its heating value; and a far larger number of heat-units were contained in a pound of ordinary coal gas than in the same weight of the best "heating gas" (taking the term "heating gas" to be simply a name to distinguish it from a gas which had not only greater heating value, but lighting value as well) yet produced. As a lighting agent, water gas had to be carburetted, or employed with some material capable of being raised to incandescence, such as magnesia, in the form of a comb, which, however, required frequent renewal. English engineers who had visited America to inspect the water gas processes in use, were of opinion that it might be an advantage to adopt the same system to a certain extent in England, if petroleum could be bought at a sufficiently low price to make the gas a commercial success; but he thought this was very questionable.

A hearty vote of thanks was accorded to Mr. West for his comprehensive and interesting address.

The Town Clerkship of Manchester.—Mr. William Henry Talbot, who has been Deputy-Town Clerk of Manchester several years, has been appointed Town Clerk, in succession to the late Sir Joseph Heron.

The Pennsylvania Oil-Wells.—An American contemporary, the *Sun*, states that ten millions of English capital is now being invested in the Pennsylvania oil wells, with a view to rivalling the Standard Company's pipe-line system.

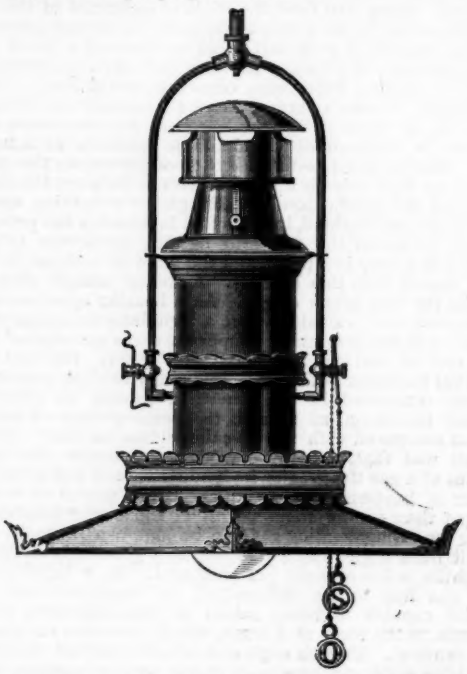
Mr. Christian Allhusen, who was one of the projectors of the Whittle Dene Water Company, and afterwards a Director of its successor, the Newcastle and Gateshead Water Company, died yesterday week, at the advanced age of 84.

The Recent Attack on Electric Light Wires in New York.—It is stated that the electric light companies in New York purpose suing the municipal authorities for £600,000, damages alleged to have been sustained by the cutting down of their wires.

Lighting and Ventilation by Gas is a subject which, in its general bearing, has of late years much occupied the attention of gas managers; and therefore the *brochure* thereon which has recently been issued by the *Journal des Usines à Gaz*, and with a copy of which we have been favoured by the Editor (M. Ph. Delahaye) will repay careful perusal. It consists of a reprint of a series of articles by M. Auguste Lévy, Engineer of the Paris Gas Company, which appeared in that publication towards the close of last year, describing, with the aid of numerous illustrations and eight lithographed plates, various installations which have been carried out by the Company in their offices and workshops as well as in other places. The book is valuable as a record of work actually done; and consequently it would occupy a useful place in a gas engineer's library, for reference in the event of an installation of gas lighting combined with ventilation being called for. Although the reproduction of the articles in the form in which they are now presented was undertaken mainly to suit the convenience of the subscribers of our French contemporary, we believe copies are obtainable for a few shillings at the office, No. 65, Rue de Provence, Paris.

THE "METEOR" STORM-PROOF LAMP.

We have on several occasions referred in favourable terms to the "Meteor" high-power gas-lamp (constructed on Westphal's patent), of which Messrs. Henry Greene and Sons, of 153 and 155, Cannon Street, E.C., are the sole consignees. This lamp has been found to give exceedingly good results in working—a very high duty being obtained per cubic foot of gas consumed; while the simplicity of its construction and its general adaptability and efficiency have gained for it the highest awards where it has been shown in competition with appliances of a like character. The makers of the lamp have now, as the result of a series of exhaustive experiments, adapted it for outdoor use, by providing it with a covering or case fitted on the outside, thus rendering it storm-proof. The lamp as thus arranged is shown in the accompanying illustration.



This form of "Meteor" lamp is specially adapted for the lighting of streets, marine promenades, railway stations, &c.; and as the light yielded is of intense whiteness, as well as of great brilliancy, it should become a powerful rival of the electric arc light, from which it is scarcely distinguishable at a short distance. Referring to the illustration, it may be mentioned that the casing which is placed over the lamp, forming the storm-proof wind guard, is the outcome of many years' special study of air currents; and the addition of this appliance to the lamp materially enhances its value for outdoor work. In exposed situations, the reflector acts as a rain-guard; but this may be dispensed with (except to throw down the light) where the lamp is under cover. One of these lamps has been fitted up over the barrier at No. 6 platform at the Liverpool Street Terminus of the Great Eastern Railway; and we understand they are about to be employed on several refuges in the south-eastern district of London. They have been adopted by a number of gas companies; the Government are at present having 18 of them fixed at Woolwich Arsenal; and they have been employed for the lighting of post offices, breweries, and wharves. It will thus be seen that the lamp is adapted equally well for indoor or outdoor lighting, with or without ventilating appliances; so that it is suitable for all requirements. But the feature of the lamp which is of special importance to gas managers is the brilliant whiteness of the light afforded, which is obtained at a cost, light for light, very much below that of electricity.

The Proposed Electric Lighting of Launceston (Tasmania).—In the JOURNAL last week we referred to a scheme which has been under the consideration of the Muncipal Council of Launceston (Tasmania) for adopting electric lighting in the town. The project, it will be remembered, had been so far favoured by the authorities that it had been submitted to Parliament for their approval. From the information in our possession there did not appear to be a very great desire on the part of the inhabitants to have the electric light; and certainly the rating powers contained in the Bill were not, as we pointed out last week, such as to stir up the dormant ardour of those who would have to pay. According to advices just to hand, we learn that the Bill has been thrown out—mainly, we believe, on account of its rating clauses, but generally because the scheme it embodied had no justification. A new Council have lately been elected; so possibly more may be heard of the matter next session, if there really exists a wish on the part of the inhabitants to have the electric light.

REGISTER OF PATENTS.

Syphon and Test Boxes for Gas-Mains.—Good, R., of Carshalton. No. 18,915; December 27, 1888. [8d.]

This invention has for its object to form the syphon and test-boxes on gas-mains in such a manner that they offer no obstruction to the flow of gas. To effect this the syphon box is closed over with a cover, preferably in the form of an ordinary roof, and with a pipe passing from each of the two sloping sides of the roof inclining upwards and curved at its upper end, so that the ends of the two pipes are brought into a horizontal position, and in a line with one another, so as to allow of

Fig. 1.

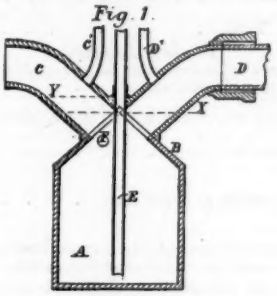
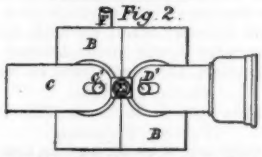


Fig. 2.



their being joined up with the pipes forming the mains. Gas flowing along one main and through one of the inclined pipes into the syphon-box will thus pass unimpeded through the other inclined pipe into the next length of main. When a length of main is to be tested, the boxes at its two ends are filled with water above the top of the openings from the roof of the test-box into the inclined pipes. A small branch-pipe rises from each inclined pipe; and to those branch-pipes the inlet and outlet pipes of a meter or indicator are coupled when a test is to be made. The pipe for pumping out and filling up the syphon and test-box is taken through the centre of the top of the roof cover; and a pipe may be led off from the gable end of the roof cover to a lamp, to serve as an indicator, and show when it is necessary to pump off the water.

In the illustration, A is the box, and B is its inclined roof. C is the inlet, and D the outlet main. C_1 is an inlet-pipe to the meter for testing purposes; and D_1 is the outlet-pipe from it. E is a syphon-pipe, for pumping water out of the box; and F is a pipe to lead to a burner when it is desired to indicate if it is necessary to pump out the water. The line X X shows the height to which water is admitted when the box is to be used for testing purposes; and Y Y, the height when repairing the outlet main, &c.

Coin-freed Apparatus in connection with Gas-Meters.—Laycock, J., of Keighley. No. 1368; Jan. 25, 1889. [8d.]

This invention consists of an attachment fixed to a wet or dry meter—by preference to the back of the index of such meter; the attachment being a cover or box divided into compartments (two of which are gas-tight), one being in connection with the gas-outlet of the meter, the other with the consumer's fitting, and the third for the reception of coins, into which they are placed one at a time, and held in a certain position until liberated by a lever, on the operation of which the coin is brought into contact with, and operates a sliding bar in connection with wheels and a valve, the latter of which is opened on the deposit of a coin, and closed by a connection with one of the rotating shafts of the meter.

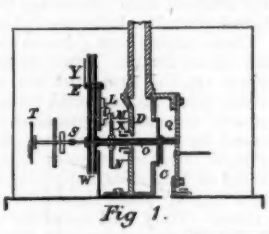


Fig. 1.

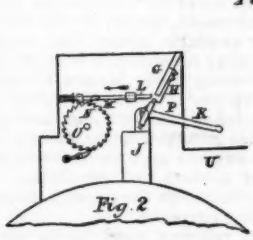


Fig. 2

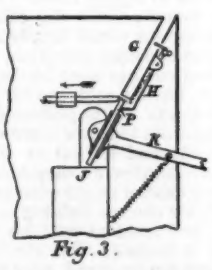


Fig. 3.

Fig. 1 is a sectional detail through the casing or box of a wet meter, showing the three compartments into which it is divided. Fig. 2 is a section of the same. Fig. 3 is an enlarged sectional detail through the slot or shoot for the reception of the coins.

To the upper part of the meter is secured a casing of suitable size

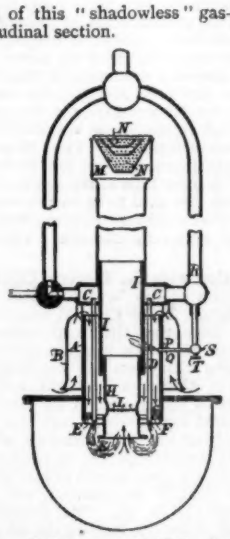
and shape; the interior being divided into three compartments, one of which has an opening communicating with the interior of the meter. The compartment D is in connection with the outlet-pipe; whilst the division E (containing the ordinary index dials and the additional operating mechanism) is arranged so that no gas can escape thereto. This is effected by a stuffing-box and gland at X, and the long bearing of the shaft S in the hollow shaft O. The compartment E is prepared with a slot or shoot G, for the reception of coins of specific value; the size of the shoot being by preference such as to receive a penny. It is provided with a lever H, hinged on a fulcrum; and when the lever is in its normal position, it is somewhat as shown by dotted lines in fig. 3. On a coin P being placed in the shoot G, the lever H is moved to the position shown by the full lines; the coin passing forward into the lower shoot, and resting on a support at J until liberated. Whilst in this position, another coin cannot be placed in the slot, or that in the lower shoot, extracted therefrom by reason of the coin resting against the bottom end of the lever, thereby causing the projection at its upper end to pass through an opening into the interior of the slot, as shown in fig. 3. On operating the lever K in an upward direction, the lower shoot, containing the coin, is moved on its axle; causing the upper portion of the coin to come in contact with the curved end of a sliding rod L, so that, before it is allowed to pass forward, the rod is moved in the direction of the arrow. The pawl M, jointed to the sliding rod, then operates the ratchet-wheel N, a distance equal to one tooth; and by the ratchet-wheel being secured on the hollow shaft O, the revolving valve-plate Q is turned a corresponding distance. Some portion of the outlet opening is thus uncovered, thereby allowing gas to pass from the compartment C to the outlet D, and the pipe connected thereto. The coin then falls into the receptacle U; the lever and lower shoot being moved back to their original position by means of a spiral spring.

To the opposite end, or on some portion of the hollow shaft O, is secured a spur-weel W, gearing with another wheel supported by a fixed stud; the boss of the wheel extending such a distance as to receive a finger pointer Y, which revolves along with the wheel on the operation of the revolving valve-plate Q, in the manner already described. To the shaft S is secured a similar wheel, gearing into a third wheel. The latter is supported and free to revolve on the extended boss of the wheel W; the face of it being graduated so that on the operation of the second wheel and pointer Y, by the deposit of one or more coins, the amount of gas in cubic feet that has been paid for is indicated on a graduated dial. The valve-plate is secured on the shaft S, and held against the revolving valve-plate Q, by means of a spiral spring arranged somewhat as shown; the surface of the plate being faced and ground gas-tight. The opposite side of the plate is also ground gas-tight with the partition between C and D. The shaft S is extended beyond the spur-wheels, and connected to some portion of the rotating mechanism of the meter—by preference to the shaft of the ordinary index T, which is operated in the usual manner. Thus, as the gas is consumed, the supply-valve plate gradually closes the outlet opening, and operates the spur-wheels; and by the time the predetermined quantity of gas has been consumed, it will have worked a sufficient distance to entirely close the opening, and stop the supply. As the gas is consumed, the graduated wheel is rotated by the index mechanism T, and shaft S, in the direction towards the pointer Y—thus showing at any time the quantity of gas still to be consumed before the necessity arises for inserting more coins; and when the graduation "zero" on the wheel arrives opposite the pointer, the faced cover-plate will have closed the opening, and entirely stopped the supply. On depositing another coin or token, and operating the lever K as before described, the rotating valve-plate Q is again moved a sufficient distance to uncover some portion of the outlet opening, thereby continuing the supply.

When applying the invention to dry meters, the divisions are arranged in the manner just described; and a connection between a shaft of the index mechanism and the shaft S is effected by gearing so as to suit the position of the ordinary index mechanism of the meter.

Gas-Lamps.—Wenham, F. H., of Woking. No. 3366; Feb. 25, 1889. [8d.]

The construction of this "shadowless" gas-lamp is shown in the engraving—a longitudinal section.



The regenerator A and the outer shield B placed around the burner of the lamp are of the usual well-known kind. The gas-arm or chamber C of the burner is fixed high up, out of the way of the flame; and from this chamber the burner (consisting preferably of an annulus of pendent gas-tubes D) descends. The lower ends of these tubes pass through corresponding holes in a plate E, in which a circular groove F is cut in an inclined direction from the top surface inwards towards the lower ends of the tubes. This is for the purpose of directing air more effectively on to the flame descending therefrom; the groove being of such a width as to give the proper proportion of outside air. A series of ribs or bridges G connect the two rings of the plate E formed by the groove F; or a series of similarly inclined perforations may be used instead of a continuous slot. The central orifice in the plate E is of size sufficient to admit of the right proportion of air descending in the annular space between the nozzle H and the plate E to supply the inner side of the flame. The nozzle is attached to the lower end of the chimney I; and it is made of porcelain or other suitable refractory material. The base of the nozzle is provided with a flange or annular projecting surface K, against which the inner air passing between the nozzle and plate impinges, and directs the flame slightly outwards. The flame is then met by the outer current of air from the slanting orifices or slot F, which air directs the flame inwards towards the central exit through the nozzle H. Above the flange or annular surface K, series of perforations L are provided in the nozzle, through which heated air from outside the nozzle passes to the interior and across the tip of the flame, so as to effect the more perfect combustion of the gas and avoid smoke. To prevent any gas which may be supplied to the burner in excess of consumption from passing straight through the chimney and out of the top, and also to arrest any soot arising from incomplete combustion, the chimney is made larger at the top than at the lower part; and into this larger part M strips of metal or truncated cones or baffle-plates N are fitted. These are made of sheet metal either perforated or not; and they may be readily removed when required for cleaning or inspection. For the purpose of igniting the gas, openings P are provided in the shield B and in the regenerator A; and also one in the chimney I, near its base; and into these openings is inserted a tubular arm Q, with a jet or nozzle at the end, through which gas passes from the supply-pipe R. This arm works on a swivel at S, provided with a cock so arranged that when the arm is turned away from the chimney, the gas is shut off. The swivel may be provided with an adjusting screw T for the purpose of regulating the length of flame through the nozzle.

Gas-Engines.—Pinkney, C. W., of Birmingham. No. 3525; Feb. 27, 1889. [8d.]

This invention has reference to such gas-engines as operate by a cycle of four strokes—viz., first drawing in the gaseous charge; next compressing the charge; afterwards firing the compressed charge; and finally expelling the residual gases and products of combustion. The principal object of the invention is to simplify the mechanism whereby this cycle of operations is performed; and it consists also in mechanism for regulating the speed of the engine.

On the crank-shaft of the engine is fixed an eccentric; the part of longest radius being at right angles to the crank. By means of a clip and connecting-rod, the eccentric is made to communicate a to-and-fro motion to a slide by which the motions of the parts of the mechanism are effected. This slide works in a guide-bracket on the side of the cylinder of the engine. In advance of this slide, and working on a pin or centre on the side of the cylinder, is an oscillating lever, the end of the long arm of which is inclined upwards. A roller on the slide bearing upon the inner face of the turned-up end of the long arm of the oscillating lever depresses the arm when the slide moves outwards (raising the short but heavier arm of the lever); and when the slide moves inwards, it permits the heavy short arm of the oscillating lever to descend. By thus operating the slide upon the oscillating lever and upon its adjuncts, the various motions of the engine are performed. The short arm of the oscillating lever carries a tubular guide, in which a rod slides. When the short arm of the lever is in its lowest position, the rod is in line with the slide, and in advance of the rod; and in line with it is the spindle of the exhaust-valve. The gas-lever has at top a link or rod, the free end of which rests on a roller carried by the long arm of the oscillating lever, and is raised out of and lowered into a horizontal position by the rising and falling of the long arm of the oscillating lever. The slide carries near its rear end a return taper-ended rod, of the kind called a "pecker." The free end of the gas-lever link is forked; and when the lever is depressed below a horizontal position, the return motion of the slide engages the pecker in the forked end of the gas-lever, but when the latter is raised the pecker does not engage with it. Opposite the end of the oscillating lever is an arresting pawl, which, when raised, is held temporarily by a spring friction-clip. This pawl is liberated when necessary from its clip by an arm on the spindle of the exhaust-valve striking against its lower end. When the short arm of the oscillating lever is depressed into a horizontal position, the rod in its tubular guide is in line with the slide—that is, the slide, the rod, and the spindle of the exhaust-valve are all in line; but the free end of the gas-lever link is raised above the end of the pecker. The normal speed of the engine is determined by a spring sliding-bolt on the weighted arm of the oscillating lever pressing against an adjusting screw carried by the fixed bracket of the engine.

Gaseous Mixtures for Use in Producing Light, Heat, and Power.—Tatham, E., of Balmain, New South Wales. No. 16,138; Oct. 14, 1889. [4d.]

This specification (not illustrated) describes the production of gaseous mixtures which may be burnt for lighting and heating purposes, or used in an engine as motive power. It is claimed that these mixtures render possible the safe and advantageous use of, and consumption together in gaseous form through one burner, of oxygen and hydrogen; the oxygen being in such quantity as to materially increase the illuminating and heating power of the mixtures. The mixture is called by the patentee "carburetted hydro-oxy gas," or "bicarburetted hydro-oxy gas."

One form of the mixture (usable by itself mainly as an explosive and motive power, and in admixture with other gases for illuminating and heating purposes) is produced by using, in reasonable proportions, oxygen and hydrogen passed, either before or after admixture, through or over hydrocarbons in a semi-fluid, fluid, or gaseous form. Another way of producing the mixtures for use either alone or in admixture

with other gases, chiefly for illuminating and heating purposes, is by the admixture with hydrocarbon gas or vapour of the gas or gaseous mixture above described, or of an explosive gas described in patent No. 13,763 of 1889.

When using the term "hydrocarbon gas" the inventor explains that he would have it understood to mean any gas or gaseous mixture in which hydrogen and carbon constitute the main part, whether chemically or mechanically mixed—such as the production of coal-gas works known as carburetted or bicarburetted hydrogen (commonly called "coal gas") and the productions of the retorting or distillation of shale, crude oils, tar, and such like materials. Again, by the term "oxygen," he means what is commercially dealt in as "pure oxygen;" and he states that he prefers to use the term "carburetted oxygen" to describe oxygen charged with hydrogen and carbon. In practice he considers it better to produce this gaseous mixture in one way by charging the hydrocarbon gas or vapour with carburetted oxygen—say, as the coal gas issues from its place of manufacture; and while still hot (but not above the temperature of say 300° Fahr.), he regulates the proportions of the mixture according to the illuminating power required. For a gaseous mixture suitable for ordinary illuminating purposes, and for use in engines as a motive power, 2½ per cent. of oxygen is added to ordinary coal gas of 16-candle power; and the quantity is increased when the hydrocarbon gas or vapour is of greater specific gravity.

Manufacture of Coal and other like Gases.—Tatham, E., of Balmain, New South Wales. No. 16,142; Oct. 14, 1889. [4d.]

This invention relates to the production of carburetted hydrogen gases (especially that kind commonly termed carburetted or bicarburetted hydrogen or coal gas), and to improvements in the manufacture of such gases from coal, shale, crude oils, tars, and other hydrocarbonaceous substances and materials. The invention has, says the patentee, been specially devised with the following distinctive objects in view:—First, to produce an improved explosive gas of a nature similar to that described in patent No. 13,763 of 1889; secondly, to improve the illuminating and heating power of carburetted or bicarburetted hydrogen or coal gas and hydrocarbon gas or vapours, and at the same time attain, at a comparatively cheap cost, a standard of purity; and, thirdly, to prevent or minimize the deposit of naphthalene and tar in gas-works and pipes, and to utilize tar and other deposited or residual hydrocarbons by converting them into fixed illuminating and heating gas or gases.

The improvement in making coal gas consists in the admixture with it of a reasonable quantity of oxygen during the process of manufacture, and at particular stages of the process. The "reasonable quantity" mentioned is explained to mean such quantity as will produce the best result attainable in the direction desired, and not to mean a comparatively small quantity which will only produce a somewhat similar result in a very much less degree. In order to be clearly understood, the patentee takes an arbitrary standard for carburetted hydrogen or hydrocarbon gases, and points out in what quantity he would add the oxygen. For example: For a gas containing (say) by bulk two parts of hydrogen and six parts of carbon, the "reasonable quantity" of oxygen added to produce an explosive gas would be from 70 to 150 per cent. by bulk of oxygen; while to obtain the best illuminating and heating results from a hydrocarbon gas or vapour of the same standard, he would add (say) from 30 to 60 per cent. In no case does he propose adding to carburetted or bicarburetted hydrogen, to improve it for illuminating and heating purposes, less than 1 per cent. by bulk of oxygen.

Where the object of the addition of oxygen is the improvement for illuminating and heating purposes of the gas to which it is added, the addition may be made at any stage of the manufacture of, or processes to which the gas to be so improved may be subjected subsequent to the carbonizing of the material from which it is manufactured, or during its storeage, as may be found most suitable.

Supplying Air to Carburetters.—Badlam, E. B., of San Francisco, California. No. 17,538; Nov. 5, 1889. [8d.]

This invention refers to a machine for proportioning the admixture of air and hydrocarbon gases. It is intended to be employed in connection with machines in which inflammable vapour or gas is produced by passing air through light gasoline or naphtha, so as to render it suitable for illuminating purposes. It is well known that the vapour produced from such liquid when air is first passed through it is very much richer and stronger than it is after a considerable amount of vapour has been taken away; and in order to properly burn the vapour, and make an equable and steady light, it is necessary to mix a suitable proportion of air with the vapour—this proportion being greater as the vapour is richer, and reduced as the vapour becomes more impoverished. The object, however, of the present invention is to provide apparatus by which this variable amount of air may be accurately supplied to the carburetter, and simultaneously mixed with the vapour after it has been produced from the carburetter; the amount being increased in one instance in proportion as it is decreased in the other.

APPLICATIONS FOR LETTERS PATENT.

67.—Parker, T., "Improvements in the distillation of coal, shale, and the like; the invention comprising the production of a special description of coke." Jan. 2.

115.—Potts, W., "Improvements in the means employed for burning gas or oil for lighting or heating purposes." Jan. 3.

210.—Thorp, T., "A frictionless metallic gas-pressure gauge." Jan. 6.

245.—Kerr, J. G., "Improvements in oil and gas stoves." Jan. 7.

254.—Kempton, C., sen., "An economical gas or oil stove." Jan. 7.

260.—Stears, J., "Improvement in preventing deposit of carbonaceous matter in ascension-pipes used in gas making." Jan. 7.

265.—Pitt, W. D., "Improvements in gas-burners." Jan. 7.

273.—Haddan, R., "Improvements in or relating to gas-burners." A communication from A. M. Ognard. Jan. 7.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Mr. Humphrys on the Specific Gravity of Gases and the Dinsmore Process.

Sir,—If anything were needed to accentuate Mr. Valon's damaging arithmetic *re* the above process, the article by Mr. Humphrys, in the last number of the Journal, would most certainly do so, although presumably it was written for another purpose. If it be only possible to discount Mr. Valon's figures from 10 to 20 per cent. by testing gases for specific gravity when in the condition assumed by Mr. Humphrys, then those figures appear to be unanswerable. The examples brought forward by Mr. Humphrys are not powerful enough to convince anyone sufficiently acquainted with the subject, so as to justify them in transferring their confidence from the results of careful experiments recorded by "Lewis Thompson and other scientists" to the *suggestions* made by the writer of the article in question. In my own case, independent experiments have confirmed the conclusions arrived at by Lewis Thompson.

George Keyte.

Westminster, Jan. 16, 1890.

Is There Anything New Under the Sun?

Sir,—I notice, in your issue of the 14th inst., an account of Kitt's improved method of unloading coal barges, which has been "patented."

Some years ago I saw in operation here, in connection with some dredging operations, a barge fitted with a number of moveable boxes, or cells, closely packed together. Each box contained about a cart-load of material. The boxes had moveable bottoms; and on being lifted high enough by a steam crane, the material fell out into a cart or waggon, the bottom closed, and the empty box was returned to the barge. The whole operation was most simple and effective.

Thos. D. Hall, Manager

Gas-Works, Montrose, Jan. 17, 1890.

Strike of Gas Stokers at Mossley.

Sir,—Under the above heading, the Chairman of the Mossley Corporation Gas Committee is credited with some remarkable statements *re* twelve and eight hour shifts. I cannot see why the length of the shift should reduce the quantity of gas made either during the 24 hours, the month, or per ton of coal carbonized. If there should be any difference, there ought to be an increase in both cases, as the stokers only working eight hours are fresher for their work than when working twelve-hour shifts—at least, that is my experience.

This winter I have been working eight-hour shifts with my stokers, having the same number of men and the same amount of wages as I had last winter with twelve-hour shifts. I have for the month of December made 249,000 cubic feet more gas; while the average per ton of coals was 11,200 feet, against 10,900 feet in December of the previous year.

Thos. D. Hall, Manager.

Gas-Works, Montrose, Jan. 17, 1890.

Gas Explosion at Lurgan.—Last Saturday week, much excitement was occasioned, in Victoria Street, Lurgan, by an explosion of gas, through which a shop and dwelling-house were suddenly wrecked. Several contiguous houses sustained minor damage, and a number of persons incurred personal injuries of a more or less serious nature. A service-pipe had been laid by the Gas Company's men to the house; and before closing up the pathway, they lighted a match, with the intention of seeing that there was no escape, when the explosion occurred. Fortunately no lives were sacrificed.

Halifax Corporation Gas Supply.—The minutes of the Gas Committee submitted at the last monthly meeting of the Halifax Town Council, contained two or three items of general interest. It was stated that the Committee had resolved that, on and after the 1st inst., the price of gas supplied within the borough should be advanced from 1s. 11d. to 2s. 2d. per 1000 cubic feet, and for gas supplied outside, from 2s. 11d. to 3s. 2d., with the present scale of discounts; that the Manager (Mr. T. Holgate) had been instructed to prepare plans, estimate, and specification for the construction of an outer lift for the new gas-holder at Stony Royd; and that the tender of the Chain Belt Engineering Company, of Derby, had been accepted for the supply and fixing of elevators and conveyors for purifiers, for the sum of £811. Some information was requested respecting an account for £208 from Messrs. Meldrum Bros. for breeze furnaces. The Mayor (Mr. Alderman Booth) replied that these furnaces were the most economical things that had been adopted for some time at the gas-works. They were now enabled to use the breeze that used to be carted away as worthless, and by this means all the steam power they required at the works was supplied. The furnaces were very effective. The minutes were then adopted.

Further Dissatisfaction with the Electric Light at Leamington.—In proposing the adoption of the Watch Committee's report at the meeting of the Leamington Town Council yesterday week, Alderman Wackrill expressed a hope that the Corporation would not permit Messrs. Chamberlain and Hookham to again open the streets until the present system of lighting with electricity was improved. Mr. Bright supported the remarks of Alderman Wackrill, and warned the public against the electric light on the ground of its cost. When he had it laid on at first, he was told that it would cost him one-third more than gas. This he did not object to; and therefore when he was charged £18 19s. 8d. for a year's electric lighting, as against £14 for gas, he did not complain; but at the commencement of last year, he was informed that the charges would have to be changed, and his bill for electric lighting for the year was £43 6s. 2d. Mr. Crowther Davies said that the incandescent system of electric lighting, as adopted in Leamington, was a perfect failure. Several other members spoke complainingly of the existing system of lighting; and the report of the Watch Committee, which was in favour of a deputation being appointed to visit a number of towns with the view of recommending the best system of lighting, was adopted.

LEGAL INTELLIGENCE.

CENTRAL CRIMINAL COURT.—Monday, Jan. 13.

The Charge of Inciting to Murder Mr. G. Livesey.—Firing at a Gas Stoker.

To-day the January Sessions of the above Court were opened at the Old Bailey, with the usual formalities. On the calendar were two charges immediately connected with the present labour troubles of the South Metropolitan Gas Company—viz., that against the man Wier, for his indiscreet utterances in Hyde Park on the 22nd ult.; and that against Higgins, the negro who discharged a revolver at a stoker on Bankside, as reported in the JOURNAL last week.

The RECORDER (Sir T. Chambers, Q.C.), in the course of his address to the Grand Jury, remarked that in the case of Wier the charge was laid under the provisions of an Act which provided "that any person whosoever who shall solicit, encourage, persuade, or endeavour to persuade, or shall propose to any person to murder any person, shall be guilty of felony." Having briefly recapitulated the facts, he advised them to return a true bill; and this was done.

Friday, Jan. 17.

(*Before Mr. Justice* HAWKINS.)

To-day *Henry George Wier* was indicted for "having incited divers persons to kill and murder Mr. George Livesey, the Chairman of the South Metropolitan Gas Company."

Mr. POLAND, Q.C., and Mr. FORREST FULTON conducted the case for the Public Prosecutor, by whom the proceedings were instituted; the prisoner was defended by Mr. GRAIN. Mr. BESLEY watched the case on behalf of the London Society of Compositors, of which the prisoner is a member.

Mr. POLAND explained that the charge arose out of the recent strike of the men who were employed at the South Metropolitan Gas Company's works, and the offence imputed to the prisoner was that, at a meeting of the men held in Hyde Park on the 22nd ult., he made use of language which could only be construed into a direct incitement to the men present to kill Mr. Livesey, the Chairman of the Company. On that occasion, a resolution was moved by a Mr. Smith, and seconded by the prisoner. In doing so, he complained that Mr. Livesey had made £40,000 out of the working man, and said he was not fit to live, and that the man who killed him would be a hero. This language was uttered to a number of excited men, and it appeared to him (the learned Counsel) to amount to a direct inducement to someone to kill Mr. Livesey. An attempt had been made to explain the meaning of the prisoner—it being stated that he never intended to incite anyone to commit violence. This, however, would be the question to be decided by the jury.

Police-constable *Lambert* proved that he was present at the meeting, and heard the prisoner make the speech referred to, of which he took notes. He was not a professional shorthand writer, and he would not say that when the prisoner made use of the expression that Mr. Livesey had no right to live, he did not use the word "moral" before the last words. He admitted that since the meeting he had made several alterations in his notes, and had struck out some portions of them.

Mr. *R. G. Emery*, a reporter, who was present at the meeting, corroborated the evidence of the last witness as to what was said by the prisoner; but stated that when he said Mr. Livesey had no right to live, he used the words "moral right."

Inspector *Greete* deposed that he took the prisoner into custody, and told him what he was charged with. He admitted having made a speech in Hyde Park, but said the observations he used were intended to refer to what was then taking place in Brazil, and not in any way to Mr. Livesey.

Mr. *G. Livesey* said he was the person alluded to in the speech. He explained that the £40,000 referred to was a fund authorized to be formed out of the money paid by the gas consumers, and the men had nothing whatever to do with it. He added that he was no party to the prosecution; and did not feel any alarm in consequence of what had occurred.

Mr. GRAIN, on behalf of the prisoner, admitted that he had made use of intemperate language on the spur of the moment, and he now deeply regretted what he had said.

Justice HAWKINS said he thought Mr. Poland would give the prisoner the credit for not wishing any harm to Mr. Livesey, but had used intemperate language in the heat of the moment, when his mind did not follow his words.

Prisoner: I have deeply regretted it ever since.

The jury returned a verdict of "Guilty."

Mr. GRAIN said the defendant desired to express his deep regret.

Mr. POLAND, on the part of the prosecution, said there was no desire to interfere with the freedom of speech, but to take care that language should not be used which might have a tendency to induce people to do acts of violence.

Justice HAWKINS said he quite agreed with the course pursued by the Treasury, and thought they were bound to take notice of such language. He considered they were bound to have it publicly declared that such language could not be tolerated. If it had been passed over, there would have been an excuse for other people making use of similar language. He thought the prosecution had been very wisely instituted. At the same time he had great pleasure in listening to the statement made by the prisoner, who, he was satisfied, was an intelligent and respectable man. He believed he did not know the effect his words might have had, and had regretted them ever since. Knowing that there was no danger of him repeating such language, he (the learned Judge) thought justice would be satisfied if he allowed him to be discharged, calling upon him to enter into his own recognizances in £100 to keep the peace and be of good behaviour, and to come up for judgment if called upon. But he would not be called upon, and would hear no more of the matter, if he kept to his present intention of never repeating such language.

The recognizances were then entered into, and the prisoner was discharged.

Charles Higgins, 29, a negro, was then indicted for feloniously shooting at Alfred Campbell, with intent to murder or to do him some grievous bodily harm. Prisoner was an American seaman, and on the 3rd inst. he obtained employment at the Bankside works of the South Metropolitan Gas Company. When he came out of the works he was assaulted by a mob of stokers; whereupon he drew out a revolver, and fired it at the prosecutor, who was a stoker, and slightly wounded him. The defence was that prisoner was attacked by an excited crowd, and what he did was to protect himself. The jury acquitted him of the felony, and found him guilty of an assault, but strongly recommended him to mercy. He was ordered to be discharged upon his entering into a recognizance to appear and receive judgment if called upon.

NEWTON COUNTY COURT—Friday, Jan. 10.

(*Before His Honour Judge* EDGE.)

The Deduction of Gas-Rental from Dividends.

Mr. *J. Williams* and his daughter, Miss *Alice Williams*, were the plaintiffs in an action brought against the Newton Gas Company to recover £3, dividends of £1 each, due in July, 1888, and in January and July, 1889. It appeared that in May, 1888, Mr. Williams was the registered holder of both shares; and he was adjudicated a bankrupt in the following June. At that time the Company alleged that he owed them for gas consumed £3 5s. 3d. The Trustee in bankruptcy gave notice to the Company that he claimed the shares; and in October the Trustee transferred them to the plaintiffs, admitting their title to them; it being asserted that Mr. Williams was only the trustee for his two daughters for the shares. The Company transferred the shares; but, inasmuch as the dividends became due before the transfer, they claimed their right, under the Companies' Act of 1862, and their Articles of Association, to deduct from the dividends the £3 5s. 3d. due to them for gas. It was contended, on behalf of the plaintiffs, that the transfer of the shares passed the dividends which had been already declared before the transfer; and that the Company, as Mr. Williams was only a trustee for his daughters, had no right to set off the sum due from Mr. Williams against the dividends. For the Company it was stated that they had no notice whatever of the trusteeship; and that, by the 30th section of the Companies' Act of 1862, they were bound not to regard any trust. It appeared that a furthur sum was due for gas consumed by the Trustee, which he had paid, leaving the balance of £3 5s. 3d. due prior to the bankruptcy. The Company, it was asserted, had always been willing to pay the difference between the dividend and the amount due to them—viz., £2 14s. 9d.—to the Trustee in the bankruptcy. They had also, before the action, written to the plaintiffs' solicitor to the same effect; but the reply was a County Court summons.

Mr. BAKER, for the Company, again expressed willingness to pay the balance of £2 14s 3d., without costs.

Mr. CREED, for the plaintiffs, pressed for costs, but, acting on the suggestion of his Honour, he ultimately accepted Mr. Baker's offer.

Judgment was then given for £1 7s. 2d. in each case, without costs.

Sales of Shares.—At a recent public sale 111 £1 fully paid-up shares in the *Kirkburton Gas Company* realized an average price of £1 13s. 9d.—— The electric light at Leamington does not appear to affect the value of the shares of the *Leamington Gas Company*, as at a sale by auction last Tuesday, some £20 "A" shares fully paid realized £44 10s.; and "B" shares £18 paid, £28 2s. 6d.

Reduction in Price by the Kingsbridge Gas Company.—At the last meeting of the Directors of this Company, they resolved to reduce the price of gas from 3s. 6½d. to 3s. 4d. per 1000 cubic feet, with 5 per cent. discount for cash; such reduction to date from the meter inspection in October last. The Chairman stated that the Company's gas was now sold cheaper than that of any other Company making not more than 6 million cubic feet per annum. With the advance in the price of coal it was hoped that many would be induced by this reduction to use more gas in the daytime for cooking and heating purposes; and to encourage this, the Company offered boiling-burners free to customers who will fix them to the satisfaction of the Engineer (Mr. J. N. Myers).

The Rochdale Gas Committee and their Out-District Customers.—A difference of opinion has arisen between the Rochdale Gas Committee and the Weurdle and Wardle Local Board. The Board want an extension of the gas-mains in order that they may obtain a cheaper supply of gas for certain lamps, the gas for which, obtained from a private owner, now costs 5s. 6d. per 1000 cubic feet. The Corporation will lay the mains if the Board will pay half the cost, which will come to £180; and the Board, in recently declining this offer, threatened to light their lamps with oil, whatever it might cost, and even hinted at the possibility of applying for a Provisional Order to obtain a supply of gas of their own. It was made a subject of complaint that the Corporation were less generous to the out-district consumers than the Littleborough Gas Company are to those in their area of supply.

Issue of Additional Stock in the Yeadon Water Company.—On the Monday of last week, Messrs. Walmsley and Sons offered for sale by auction, at Yeadon, £20,000 worth of stock in the local Water Company, being part of the additional capital of £28,000 authorized to be created by the Company's Act of last session. The stock is entitled to rank for dividend with the original capital, up to and including 7 per cent. per annum; and the deficiency of dividend which in any year shall have fallen short of 7 per cent. per annum, may be made up and paid out of the surplus earnings of future years. For the first £100 of stock offered a premium of 10s. was bid, and the lot was sold; but the legal advisers to the Company stated that they could not take less than a premium of 20s. per £100 of stock. Bidding was not at all brisk, and only £800 worth of stock was sold in the room; the premium for seven lots being £1, and that for the remaining lot £1 10s. Five £10 shares in the Company, £6 4s. paid up, were next offered; but no bid could be procured.

MISCELLANEOUS NEWS.

GAS WORKMEN AND THE LABOUR QUESTION.

The South Metropolitan Company and their Difficulties.

Although the movement among the gas workmen of South London, the chronicle of the progress of which has occupied considerable space in the last few numbers of the JOURNAL, is in a decidedly moribund condition, it has not yet reached that state of utter collapse which would justify us in ceasing to notice events in connection with it which it is desirable to place on record. These remarks will serve as an introduction to the matters given below.

We concluded last week with a brief notice of the five open-air demonstrations held on Sunday, the 12th inst., at each of which a resolution was passed in the following terms:—"That this meeting of gas workers and others, in public assembled, pledges itself to assist our brothers now out on strike until the strike is over, and calls on all Trade Unionists to assist us in this battle for the liberty of labour." These meetings—or at any rate, the two principal ones, at Barking Road and Peckham Rye—claim more than the short notice hitherto given to similar gatherings, from the fact of our having been informed that it was the intention of one of the speakers to controvert the statements which appeared in the editorial columns of the JOURNAL on the previous Tuesday. This being the case, we were requested by Mr. J. Walsh (who had been selected to reply to our statements) to attend the meeting at Morley's Corner, Barking Road, for the purpose of taking a note of what he had to say. The gathering was a fairly large one—there being about 1500 men present; and the proceedings throughout were very orderly. The Chairman (Mr. Riley), in his opening remarks, said they had met that day to prove that the Gas Workers' Union was not disorganized. He was sorry to say the defaulters of East Ham were not coming forward with their money as they should do; and the meeting had been called to put some enthusiasm into them, and make them as firm as they were nine months ago, when the Union was started. The next speaker (Mr. Watkinson) denied that the men were on strike; but said they had simply refused to work under a system of coercion. What they wanted to do in the future was to beware of all such things as bonus schemes. Some three months ago, at that very spot, he had occasion to refer to a yard foreman at the Beckton Gas-Works, who so far preferred non-Union men that he was willing to pay them 1s. a day more than Society hands. Mr. Gardiner then moved the resolution above given. In doing so, he said they had no alternative but to fight; and he was sure those present would agree with him—whatever the public and the gas journals might think. The comments of the latter, however, he would leave Brother Ward to deal with. When the public knew the truth, they would not help Mr. Livesey to fight the battle; but would give their assistance to the men. Mr. Livesey was not alone, for his co-Directors (or at least some of them) were quite as much in the "swim." Had it not been so, Mr. Livesey might before then have given in. Mr. Livesey had said at the cenference with the men: "We shall have to fight. If I win, I win; but if I lose, I retire." They would see if he were an honourable man; for he had already lost the fight. He next said: "I have £40,000 at my back that the Government has allowed me to keep out of your hard earnings; and that I will fight you with." Had the journal that had had the impudence to say they were self-elected members, and that their President had led the men wrong, ever had the manliness or courage to print the words he had just made use of? It was his opinion that Mr. Livesey had already had to spend the whole of his £40,000; and that it had cost the shareholders another £40,000 besides. He said there had been an assertion made that they were self-elected men at the head of their Union. He asked the meeting if this were true. (Cries of "No.") Every man at the head of that Union had been honestly elected according to the rules of the Society. Mr. Ward, who seconded the resolution, said he had not intended to address the meeting at all; but having read the last issue of the JOURNAL OF GAS LIGHTING, and seeing that there was a reporter present representing that paper, he had resolved to say a few words. Mr. George Livesey had denied, times out of number, that he ever made use of the expression that he would "smash up" the Gas Workers' Union. He (Mr. Ward) heard him do so when he attended, with twelve others, a conference held in the Company's Board-room on the 15th of November last. When it came to his turn to speak at that conference, he asked Mr. George Livesey how it was that he had not brought forward his bonus scheme twelve months before; and Mr. Livesey answered that the men had no Union at that time to assist them, but that now their Union was powerful, and he formulated that scheme as a safeguard against a strike. The JOURNAL OF GAS LIGHTING stated, in its leading article of the previous week, that the Union was already smashed up. He denied that there was even a chance of the Union smashing up. The Gas Workers' Union was stronger that day than it had ever been before. In this fight Mr. King, through his paper, was bottle-holder for Mr. Livesey; but Mr. King might take it from him (Mr. Ward) that he would not be able to injure one hair of the head of the Union. He had in his pocket a letter from Mr. Trewby, the Chief Engineer of The Gaslight and Coke Company, complaining that, at several of the stations during the past Christmas, the men neglected their work, and drank their money away; and adding that he was very sorry to say that the high wages the men were getting mostly found their way to the public-houses, to the detriment of the men and their families. If this was really the case, it was a shame to the men that their employers should have to cast this in their teeth. It had been stated in the papers that the Union intended to call out the stokers of The Gaslight and Coke Company. As a paid servant of the Union, he could assure them that such a thing had never occurred to them. They thought it was their duty to keep the men on that side of the river fully employed, so that they could assist the men on strike on the other side. The resolution was then carried unanimously. Mr. Walsh, who had just arrived, said he intended to reply to the JOURNAL OF GAS LIGHTING, and the lies that had been heaped upon the Executive of the Gas Workers' Union. There were only two paid servants of the Society—Mr. Thorne and Mr. Ward. He himself had been duly elected; and he believed all the other elections were also by ballot. Mr. Thorne and Mr. Ward were certainly elected by ballot. Before the strike on the other side of the water, there was a ballot taken as to whether or not they should come out, and so the matter did not rest with the leaders, but with the rank and file. Every one of the men belonging to the Union signed a petition that the notices should be sent in; and therefore the Executive could not be blamed and accused of duping the men. As for going about the country spending the money of the members of the Union, and living like gentlemen, if working hard for eight hours a day, without a minute to spare, was the life of a gentleman, he hoped Mr. King, Mr. Livesey, and Mr. Morton would have a turn at it. The speaker then went on to say that the present strike pay of 10s. per week was not sufficient to enable the men and their families to live; and he urged the members to come forward with their subscriptions, and enable the weekly allowance to those on strike to be raised to 15s. As to the action of the Government, Mr. Livesey had said in his Board-room that, if the Union had 1000 pickets, he would have 4000 police, and that the Government would back him up with the whole of their power. Why could not the Government stand aside and see fair play? After a short speech from Mr. Brougham, who dealt with the subject of the bonus scheme as a "business man," the meeting dispersed.

At the meeting on Peckham Rye, Mr. Hutchins presided; and, in opening the proceedings, said that in the present struggle Mr. Livesey and his colleagues had hitherto had the assistance of the public, the Press, and the police; but the time had arrived when it was their duty to turn the sympathy of the public on the side of the men. The Trades Unions had at last discovered that the result of the struggle would not only affect the gas stokers, but the whole of the working classes. Therefore, at the representative meeting in Mile End on the previous night, the members of the Unions had promised to stand by them, and give them monetary and other assistance. He felt sure it would not be long now before the gas men won a great and glorious victory. The Company were in a critical condition, notwithstanding their boasting assertions to the contrary. They were charging their customers for double the quantity of gas that was consumed, because the blacklegs wasted more gas than they made, and sent into the mains instead huge quantities of sulphur and air. (Laughter.) The consumers were recognizing the true position of affairs, and were, as a consequence, beginning to sympathize with the stokers in their struggle. If the men allowed themselves to be trampled upon now, hundreds of others would be trampled upon hereafter. Mr. Hugh Brown, of the South Side Labour League, said the only hope of the workman was in unionism; for by strong combination only could he overthrow the large bodies of capitalists and monopolists in the country. At the meeting on the previous night, the delegates of the Amalgamated Society of Engineers, one of the largest Trade Unions in the world, declared with one voice that the battle the gas workers were fighting was one that called forth their entire sympathy, and would have their monetary help. This meant victory for them; for they would have enough support from the Unions to sweep away 50 Liveseys. Mr. Livesey's position was becoming weaker every hour, notwithstanding all the thousands of pounds he had spent. He himself had been informed that something like £100,000 had been expended already. The shareholders would not allow their money to be squandered like that any longer. There was another good thing on the men's side—their leaders were men who worked with them, men who sympathized with them, and men who would pull them through, and not men who led them for the purpose of gain. He then moved the resolution already given. Mr. Mohun, of the Gas Workers' Union, seconded the resolution, and said the promised assistance from the Trades Unions would help them to win a victory which would be the greater and more glorious on account of the difficulties with which they were struggling. The resolution was carried with cheers for the men on strike.

With regard to the determination arrived at by the Strike Committee to continue the struggle, Mr. Frank Livesey, in the course of an interview on Monday last week, pointed out its utter futility. He stated that the Company had been able to make such headway with the manufacture of gas, that the previous day they were in a position to dispense entirely with the day shift at the Old Kent Road station, and had almost returned to the normal supply. The work at all the stations was going on smoothly. With regard to the coal supply, he said there were more ships waiting in the river to be unloaded than the Company's jetties would accommodate; and only that morning he had had an interview with five or six of the captains, who in every case informed him that they required no hands to man the colliers. The gratuity system being at an end, the Company had been able to so far return to the normal condition of things as to require a week's notice on either side before the men could leave the service. Returning to the proceedings at the meeting of delegates on the 11th inst., at Mile End, Mr. G. Davis, Secretary of the Strike Committee, denied that the struggle was being prolonged for the sake of well-paid leaders, and expressed his concurrence in the desirability of letting the public know the actual payments the leaders were receiving. The following is his statement:—"The only paid officers in the Gas Workers' Union are the Secretary (Mr. Thorne), who receives £2 5s. per week for his whole services; and the Assistant-Secretary (Mr. Ward), who receives 35s. per week. Neither of these receives anything extra in connection with the strike. Mr. Mark Hutchins, the President of the Union, has not yet received one penny for his services in that office. It is at present a purely honorary position. As Chairman of the Strike Committee, the duties of which occupy all his time, he is being paid at the rate of 5s. 4d. per day as an equivalent for his loss of wages; he being in the employ of The Gaslight and Coke Company. In addition, he receives 1s. per day expenses. The Secretary (Mr. Davis) is allowed 30s. per week, and 1s. per day expenses. The rest of the Committee are all South Metropolitan Gas Company men, and only receive their strike pay with the 1s. per day expenses, except the Treasurer (Mr. Mohun), who is allowed 15s. per week in addition to the strike pay, but no other expenses." Outside the Committee-rooms it was rumoured that the men were becoming dissatisfied that the struggle had not been concluded.

On Tuesday evening, Mr. Hutchins, in reply to the rumours just

referred to, said the number of men receiving strike pay was only 37 less than it was a week previously; and of these only a small proportion had applied to be reinstated in the gas-works—the rest having found work elsewhere. The 2000 men who came out had, he said, stuck well together, though the men with wives and families were beginning to feel very severely the pinch of the struggle. At Vauxhall, Mr. Thorne had put it to the men whether, considering the length of the struggle and the drain upon the funds of the Union, they would be prepared to give up the fight, and go back to work; and the reply of the men was unanimously against such a course. The men still had entire confidence in their leaders, and were determined not to return to work until their struggle ended in victory. Mr. Hutchins, in a speech he made in the course of the day, as Chairman of a meeting held by the men, remarked that it was very extraordinary that while the other Gas Companies in London were suffering from a short supply of coal, there should always be plenty of ships on the way to the South Metropolitan Gas-Works. The men could not resist the conviction that there was a conspiracy by which the other Companies were helping Mr. Livesey. It was this sort of combination which had made the battle so hard for the men to win. He (Mr. Hutchins) still cherished a hope that means would shortly be found for bringing Mr. Livesey and the men together on some basis of settlement which would be acceptable to both sides; for he thought even Mr. Livesey must be tired of the present state of things. The men were quite ready to enter into negotiations with him; but he would not advance one step to meet them. Speaking at another meeting of the men, Mr. Thorne stated that the gas workers and their Union were in a deplorable condition. They had £2700 in the bank at the commencement of the strike; but he was sorry to say that they had drawn it all out but £400. It was said that there would be no money for them that week. They were only receiving 10s.; that was small, but it was all they could give. A sum of £150 had been spent in sending men back to the places they came from; and £30 had been expended in defraying legal costs. Atthe works on the north of the Thames, the men—stokers and others—were shirking their duties, and doing half they should. A strike was threatened there. The Union, he regretted, was in a most deplorable position; and he feared that Mr. Livesey would eventually beat them.

The following letter, from a "Stoker Unionist" at the Chartered Company's works, appeared in the *Standard* last Tuesday:—"I have observed several letters in your paper, which state that Mr. Tom Mann and Mr. Tillett intend to order us out of these works, where I have been 17 years. Are we slaves to these agitators? I say 'No'; and we begin to see that the whole thing is being made a business of. Why have these men been dogging about this locality for the last month? Are they taking soundings? I warn my fellow-workmen to look to themselves and their homes and families, and not to become pauperized to fill the agitators' pockets. I have heard a good bit about Mr. Livesey; but I never see him, nor do I want to do so. But I think the thanks of the honest worker are due to him for showing that he is determined to protect honest labour."

The close of the week was marked by a fresh attempt to terminate the dispute amicably. On Friday an interview took place between Mr. George Livesey (who was accompanied by Mr. F. Bush) and a deputation from the Gas Stokers' and Coal Porters' Unions, with a view, if possible, to arrive at some settlement. Mr. Livesey had expressly stipulated that the members of the deputation should be chosen from his old *employés;* and consequently none of the Gas Workers' Union officials were present. A long discussion took place; but Mr. Livesey refused to depart from the attitude he had maintained towards the men from the first. He told them that, so far as the Company were concerned, they declined to recognize that there was any strike, and said he thought the men were very foolish to continue spending their money in strike pay. The utmost concession he was prepared to make was that if the men would admit that the strike was finished, he would take some of them back singly to fill up any vacancies which might arise. Finding it impossible to come to any arrangement satisfactory to them, the deputation withdrew, and reported the result of their interview at the headquarters of the Strike Committee. In the evening a mass meeting of the men was held in the large hall attached to the Liberal and Radical Club, Peckham, and the position of affairs was laid before them. The men were then distinctly asked whether they were prepared to admit that they were beaten, and were willing to go back on Mr. Livesey's terms. There were loud shouts of "No," and cries of "Fight it out to the bitter end." At the termination of the meeting, a procession was formed, and went to the Old Kent Road, where a meeting of the Executive Committee took place, and great regret was expressed at the position taken up by Mr. Livesey. It was stated that the Union would not, under any circumstances, allow the men to go back except in batches and to all the stations. They would fight the battle out till every penny they had was exhausted, rather than give way on the terms proposed. With regard to the funds of the Union, which, as stated above, were reported to be very low, the Treasurer (Mr. W. Byford) wrote to one of the London evening papers an explanatory letter, in which he said: "This unfortunate strike, which has now lasted five weeks, was forced upon us by Mr. Livesey, and has cost us up to the present over £5000. This has been met somewhat by a levy upon our members, who, I am glad to say, have responded nobly. We have paid the strikers 10s. per week and 5s. extra in Christmas week; and I am pleased to state that instead of our funds being down, and our Society in a deplorable condition, the funds were never better. Last week our own income was over £800; this week up to date it is over £500. Independent of outside support, which is coming in very well just now, we paid our strikers last week without calling on our bankers, and we are prepared to do the same this week. Now, these facts will show that the Society was never in a better condition numerically or financially. Our numbers and income are increasing, our expenses are decreasing, so that our prospects financially of winning the strike were never better."

A demonstration of the men was held last Sunday afternoon in Hyde Park, when addresses were delivered from three platforms. The principal speakers were Mr. Mark Hutchins, Mr. W. Thorne, Mr. M. Henry, and Mr. Walsh. The following resolution was passed:—"That this meeting is of opinion that the terms of the men were reasonable, and regrets the opposition of the Company to meeting the moderate terms of the men." There was a very liberal use of boxes and bags for the collection of funds in support of the men.

At the Greenwich Police Court last Wednesday, two labourers named M'Carthy and Corpe, were charged on remand, before Mr. Kennedy, with assaulting a waterman named Davis, one of the new hands in the employ of the Company. On Saturday, the 4th inst., Davis was taking a barge of coal along the Surrey Docks to the Company's premises; and as he passed Quebec Wharf, where a number of men were carrying and stacking timber, he heard someone say, "Here comes a barge of gas coal;" and he was asked if he had a ticket. He said he had not, and was called a "blackleg." Pieces of dirt, match-boarding, and stones were thrown at him on the barge. As he moved farther away, bricks were thrown at him, and a stone struck him and knocked him down. He got up and said, "Give me a chance, mates—I've done nothing to you," and then the throwing ceased. Someone called out to those on another barge to send him adrift, and throw him into the water; and a man boarded his barge, but, as it was going fast, had to step on shore. Both the prisoners were there, and threw at him; and when throwing they were nearer to him than the others. The defence was that the prisoners did not interfere with Davis in any way, and that it was a case of mistaken identity. They called a number of witnesses, who said they did not see anything thrown by the accused. M'Carthy was fined 40s., or one month's imprisonment; and Corpe £3, or six weeks' imprisonment. The fines were paid.

The Strike of Stokers at Mossley.

The position of affairs at the Mossley Corporation Gas-Works improved during last week. The stock of gas was largely increased, so that now there is no fear of running short. Four more new stokers have been engaged from Manchester, and two of the four benches of through retorts which were last week standing idle have been prepared and brought into use as a relief, and will be dispened with as soon as possible. There are now 24 stokers engaged, being the full number. The old stokers, who are out of work (19 of them), expected to receive strike pay from their Union last Saturday. The new stokers are still being lodged and boarded on the works.

CLECKHEATON LOCAL BOARD GAS SUPPLY.

Enlargement of the Works.

In an article which appeared in a Leeds contemporary last Wednesday, dealing with the public improvements now being carried out at Cleckheaton, some prominence was given to the extension of the gas-works, which is called for by the increased consumption. While ten years ago the quantity of gas produced was only about 20 million cubic feet, three times that bulk is now required. But it seems that there are also other grounds for the changes taking place. The old works are situate in the district of the Liversedge Local Board; and the Cleckheaton Board have not only to pay a considerable rate in respect of them, but the disbursements for cartage, owing to the distance from the railway, amount to no small sum. With these things to guide them, the Cleckheaton Board have secured a site for new works adjoining the railway; and it is intended that a siding shall be provided, so as to give direct communication between the works and the railway. The immediate proceedings in which the Board are engaged are the erection of a gasholder on the site of the new works, and negotiations with the railway company with reference to the siding. The site acquired consists of six acres of land; and as soon as it is advisable, the Board will secure the removal of the whole of the plant from the Liversedge works—a course of action which, it is thought, cannot long be delayed. The amount now charged to consumers of gas is at the rate of 3s. per 1000 cubic feet; and it is hoped that no increase will be enforced by changes in the price of coal. Gas of 17¼-candle power is supplied, although the Act only prescribes 14 candles. The new gasholder which is being constructed is of a capacity of half a million cubic feet, and is 120 feet in diameter. Messrs. W. C. Holmes and Co., of Huddersfield, are the contractors for the holder; and Messrs. Gould and Stevenson, of Hunslett, those for the tank. The work is proceeding under the supervision of the Gas Manager (Mr. G. H. Niven).

PROPOSED PURCHASE OF THE CANTERBURY GAS AND WATER WORKS BY THE CORPORATION.

A Meeting of the Canterbury Town Council was held last Wednesday to receive the report of the Committee appointed to consider the proposals contained in the Bill promoted by the Canterbury Gas and Water Company.

The Town Clerk read the report of the Committee, as follows:—"The Committee, having considered the Gas and Water Bill, and also the desirability of the Council having in future the control of the lighting and water undertakings in the city, recommend that before entering in detail upon any objections there may be to the Bill, the Council approach the Company with a view to ascertain if it will sell its gas and water undertakings to the Council, and if so upon what terms." Mr. Prentice said the Committee commenced to consider the matter, but they found this question blocked the way; and, as it was of great importance, it was necessary it should be disposed of at once. As questions might be asked which it would not be advisable to make public at present, he would like to propose that the Council resolve itself into Committee, and discuss the resolution they had been asked to confirm. Mr. Harris seconded the proposition. The motion was agreed to, and the Council retired. On returning, Captain Lambert said the resolution placed before the Council in Committee was to this effect—"That the Gas and Water Bill Committee be authorized to meet the Directors of the Gas and Water Company to ascertain whether the Company will sell its gas and water undertakings to the Council, and if so upon what terms." He begged to move that it be adopted. Mr. Harris seconded the motion; and it was unanimously carried.

LOTHAMMER GAS COMPANY, LIMITED.

An Adjourned Extraordinary General Meeting of this Company was held last Wednesday, at the Offices, No. 6, Lombard Court, E.C.—Mr. C. E. Parker Rhodes in the chair.

The Chairman said that since the meeting on Dec. 18 (see Journal for Dec. 24, p. 1212) the Provisional Board had made efforts to place the majority of the 38,000 shares given in part payment to the vendor in a position that would make it equitable to all concerned, but without satisfactory results. They had, therefore, to ask the shareholders' consideration to a very simple method to meet the antagonistic interests in the Company. Financially, the position was exactly the same as on Nov. 18 and Dec. 18, 1889, with the exception that the cash balance at the bank had been reduced from £186 to £13. The suggestion to pay an instalment of 1s. per share on the unpaid calls was met by complaints of misrepresentation in the prospectus, and false statements in the newspapers as to the premium on the shares. The Board, at the earliest moment, dispensed with the three *employés*, and he (the Chairman) had taken the responsibility of attending to details. He might say that many of the contracts entered into had not been properly executed, but the work had in some cases been partially carried out. The future of the Company was promising, judging from the proposals that had been recently made. In France and several other places Mr. Lothammer's system was in use. Looking at the conditions under which coal gas was supplied in England and throughout the world, the Company's patents must undoubtedly be of considerable value. The claim against Mr. Bower for £212 overpaid by the late Board to that gentleman was still unsettled; and Mr. Bower had made a set-off claiming £30,000 damages against the Company. In view of the development of the undertaking, the following proposal was submitted for approval by the shareholders—viz., that every £100 of net profit from Jan. 1, 1890, should be divided as follows:—Three-tenths on cash paid-up shares, and on shares with calls unpaid; two-tenths on vendors' shares, as per nominal value; one-tenth on vendors' shares as transferred for consideration; and four-tenths on the newly-subscribed shares to be paid in full. Certain proposals also followed with regard to voting power.

A long discussion then ensued as to the best method to be adopted for the settlement of the claims of the various classes of shares, in the course of which an alternate scheme was brought forward by which those shareholders who had paid cash for their shares should be entitled to a preferential dividend of 10 per cent. and half of any surplus profits, but that as soon as the bonus amounted to £1 a share, the preference should cease, and the shares all fall into one category. Ultimately the resolution to wind up the Company, which was proposed at the last meeting, was negatived; and it was arranged that further efforts should be made to come to satisfactory terms with the holders of the vendors' shares.

The proceedings closed with a vote of thanks to the Chairman and Directors.

PARA GAS COMPANY, LIMITED.

The Directors of this Company have issued to the shareholders their report and balance-sheet for the half year ending Sept. 30, together with the balance-sheet for the previous six months. The results of the working have not been as good as the Board could have wished. There has been no material improvement in the revenue from private lighting, which was confidently expected, owing to the decreased charge alluded to in the last report, and to the fact that gas of a higher illuminating power has been distributed. The cost of coal and freights, it is stated, still continues high. The debts due by the Government have further increased in amount, and are now represented by the following figures:—Public lamps, £12,917, as against £10,547 in March last; public establishments, £2219, as compared with £2131. This, the Directors point out, is a most serious drawback to the success of the undertaking. The public lighting accounts for November and December, 1887, have not been paid; and five months are still owing for the year 1888. No interest is allowed on these arrears; but, on the other hand, the fines have been remitted for the five months of the year 1888. The interim dividend declared, as advised in the last report, has not yet been paid, simply for the reason that there have been no funds available for the purpose; and the Directors recommend that no further dividend be declared until the authorities liquidate their present heavy liabilities. In regard to recent events in Brazil, the following letter has been received by the Manager (Mr. J. Gibson Newbigging) from the Provisional Government of the Federal State of Pará:—"In reply to your official letter, dated the 23rd of November last, this Council has to declare to you that the Government will faithfully respect all contracts, doing their utmost that all the clauses contained in them may be fulfilled, and will provide that the Company be opportunely indemnified the amount owing to them by the State." This assurance the Board have received with great satisfaction; and they are glad to report that £2400 has been received since the change of Government. The Directors also state that they have every reason to be thoroughly satisfied with the ability and good judgment of the Manager and his staff; and they announce, with great regret, the retirement of Mr. Robert Morton from the Board. In his place they have elected Mr. C. W. C. Givens. Turning to the accounts, it is seen that the revenue for the six months ending March 31 was £14,240; and the expenditure, £10,727. The balance at profit and loss account was £10,676. The financial statement for the half year ending Sept. 30 shows that the revenue amounted to £13,195; and the expenditure to £10,272. The balance at profit and loss account is £9469.

Explosion of Gas in Newcastle.—At three o'clock last Friday afternoon a serious gas explosion and fire took place at No. 10, Ellison Terrace, Newcastle-on-Tyne. The property is situate near the Blyth and Tyne Railway Station, and there had been a strong smell of gas overnight. A large accumulation of gas became ignited, and the house was wrecked. There were some people in the house at the time, who were rescued with much difficulty. The personal injuries sustained were not, however, serious; and when the gas had been cut off, the fire brigade speedily extinguished the flames.

BORDEAUX GAS COMPANY.

According to the report of the Directors of this Company for the year ending June 30, 1889, which, with the statement of accounts for this period was presented to the shareholders at their recent annual general meeting, the working of the undertaking resulted in a profit of 924,364 frs. This was disposed of as follows:—Reserve fund, 46,218 frs.; share sinking fund, 60,000 frs.; interest, 150,000 frs.; Directors' fees, 66,815 frs.; paid to shareholders, 390,000 frs.; founders' shares, 130,000 frs.—total, 843,033 frs.—leaving 81,331 frs. to be carried forward. By this apportionment of the divisible balance, the statutory reserve was brought up to 451,662 frs.—more than 150,000 frs. in excess of the statutory proportion of the share capital—and the dividend was at the rate of 90 frs. per share (500 frs.). In the course of the twelve months covered by the report, 23,192,744 cubic metres of gas were sent from the works; producing a revenue of 3,712,691 frs. Compared with the preceding year's working, the bulk of gas accounted for was less by 248,619 cubic metres; while the receipts were higher by 46,680 frs. This excellent result was brought about by a reduction in the leakage. The mains were renewed and enlarged to the extent of about 4380 yards; the total length being increased by 4130 yards. In the suburbs of the city, 1000 yards of new main were put in. The number of meters in use on June 30 last was 13,700—equal to 165,761 burners. Of the total number of meters fixed at that date, 578 were the property of the consumers; the municipal establishments and the Grand Theatre having 232. The above-named total was an increase of 383 meters, mostly required by private consumers, in the year. In the suburbs, there were 370 meters in use. At the date of the report the number of public lights in the city was 4909, as compared with 4852 at the corresponding period in 1888; the number in the suburbs being 442. The highest day consumption of gas in the financial year was on Dec. 24, 1888, when the quantity sent out was 104,032 cubic metres. It may be remembered that the Company have erected new offices, which were opened with some ceremony a short time ago.

PROPOSED EXTENSION OF THE BRADFORD ELECTRICITY WORKS.

The electric light appears to have found great favour in the eyes of the people of Bradford; and the growth of consumption (five times the quantity with which the works commenced) has compelled the Gas and Electricity Supply Committee to seek authority from the Council to expend a further sum of £10,000 on additional plant, and to appoint Mr. Sydney Baynes Managing Engineer of the works, at a salary of £250 a year.

The Chairman of the Committee (Alderman F. Priestman) proposed resolutions to the above effect at the meeting of the Council last Tuesday; and in doing so, he gave some interesting particulars concerning the works. First of all he reminded the members that a few months ago they passed a resolution authorizing the Committee to obtain borrowing powers to the extent of £30,000. These borrowing powers had not yet been obtained; but he believed the question would be settled in a few days. When they obtained leave to borrow this money, he promised the Council that none of it should be expended without their permission, and he asked that the Committee be allowed to expend a further sum of £10,000. The present installation was designed with a view of having a certain amount of spare engine power; and when it was started towards the latter end of September, a flow of only 330 ampères was sent through the dynamos. Since that time a maximum flow of 1530 ampères had been reached. Inasmuch as the engines were designed in the first instance for only 600 ampères each, with a view of having one reserved for the contingency of an accident, it followed that if only two engines were run they were considerably overloaded. Four mains were put down, with the intention that they should supply a maximum flow of 300 ampères each, or 1200 ampères in the aggregate; but so great had been the demand for the current that some slight amount of risk had been run by making use of the third engine, and supplying 1530 ampères through four cables, although only designed to carry 300 ampères each. The Committee were anxious to obviate this risk. Applications had been made for at least 700 additional lamps, which the Committee dared not allow to be put on. The only respect in which he was deficient in information to lay before the Council was in his inability to produce a financial statement that would show the profit and loss on this transaction. Inasmuch as the building was designed for twice, thrice, or even four times the amount of work which it was now doing, a further reasonable expenditure of money would be in the direction of making the works pay. The Committee would not lay out any of this money until tney had the financial statement put before them as clearly as possible, in order that they might arrive at a conclusion as to whether or not the price of 5d. a unit paid. If it did not, it would be their duty, in further contracts, to charge such a price as might be found necessary. He thought the Council might trust the Committee to expend this sum of £10,000. The amount of money received up to the end of December (the installation having been started with only a very small load at the end of September) was close upon £500; and the income for the previous week was rather more than £80. What the Committee were thinking of doing in the first instance was to put down an engine to supplement those which they had now—an engine, perhaps, of 250-horse power instead of 150-horse power—and then to run this instead of one of the smaller ones, leaving one to fall back upon in case of accident. If they should be able to make terms with occupants of property in Westgate, or another part of the town, they would probably ask to be allowed to put down a second engine, and perhaps two more of the main cables. It was clearly to the interest of the Committee that the addition of power should be made in time to place the maximum quantity of electricity at their disposal as soon as the dark days began towards next winter. Mr. Baynes, whom it was proposed to appoint Managing Engineer, had taken the entire management of the installation since Nov. 1. The motion having been seconded by Mr. Barker, an objection was

raised by Mr. Galloway to the laying out of further money for electric lighting purposes at the present time. The cost of electricity to persons who were supplied with it was, he believed, about double that of gas; and he thought that when the consumers received their accounts, the expense would possibly be such as to cause them to order the discontinuance of their supply. The gas-works were a paying concern; but with the recent increase in the price of coal, and in the stokers' wages, it would now be perhaps difficult to carry on even the gas-works without a loss; and the difficulty would be much greater in the case of the electricity works. Mr. Newboult hoped the Committee would push their scheme forward; but Mr. H. Lister opposed their proposal, and urged them to give more attention to the lighting of the out-districts by gas before they launched out into further expenditure for electric lighting. Mr. Hindley likewise called attention to the defective lighting of the out-districts. A question was asked by Mr. Pratt as to whether the engagement of a Managing Engineer would result in the services of Mr. Shoolbred being dispensed with. It seemed to him that they ought not to keep Mr. Shoolbred on after this engagement. Mr. R. Shackleton demurred to a statement which had been made to the effect that great ability had been displayed in laying down the electric lighting plant. He was of opinion that in the first place the arrangement of the plant was not the work of an Engineer. He had said this before Mr. Shoolbred; and he had no hesitation in repeating the statement. Alderman Priestman then replied on the discussion. He assured Mr. Galloway that he need not be alarmed at the extension of the electric lighting in relation to the prosperity of the Gas Department. He might say that in spite of the operation of the small electric lighting installation, there had been during the last six months an increase of 6 per cent. in the consumption of gas, and if it had not been for one very bad month, he believed the increase would have been 10 per cent. Therefore, it was obvious that, with the continuance of good trade, it would be absolutely necessary before long to enlarge their gas-works. Further than that, he could assure them that there was quite as much doubt now as to whether the gas paid the Corporation as there was with regard to the remunerativeness of the electricity supply. Therefore it might be just as necessary for people to pay more than 2s. 3d. per 1000 cubic feet for gas as it might be for them to pay more than 5d. pet unit for electric light; and in either case if it was necessary to raise the price, it must be done. Mr. Shoolbred's position in relation to the Committee so far had been like that of an architect; and he had had 3½ per cent. upon the cost of the engines, buildings, and dynamos, and had spent a very considerable proportion of his time in the town. He would certainly receive the same commission on the new work which the Committee expected to execute; and he (Alderman Priestman) hoped that in the meantime they would come to some arrangement by which, for a small salary, he might remain as the Consulting Engineer for that department. The resolutions were adopted.

The Electric Lighting at Barnet failed in several parts of the town last Thursday night—one being at a road junction where, above all places, light is specially required. How long will the inhabitants submit to these vagaries of their new illuminant?

Further Serious Subsidences of Land at Northwich have occurred during the past few days. In one case the ground sank about 10 feet below its former level in the course of an hour. These repeated subsidences cause considerable damage to the gas and water mains.

Proposed Introduction of Mechanical Stokers at Oldham.—At the meeting of the Gas Committee of the Oldham Corporation last Wednesday, the question of the introduction of mechanical stokers came up for consideration, and the Manager (Mr. John Chadwick) was instructed to make an inspection of places where they are in operation, and present a report.

Advance in the Price of Gas in Cornwall.—Owing to the increased charge for coal, the Directors of the St. Austell Gas Company have been compelled to raise the price of gas 6d. per 1000 cubic feet; and an advance of a similar amount has been made by the Falmouth Gas Company. In the former town, where there is an electric light company, several large consumers have, we believe, intimated their intention of discontinuing the use of gas.

Shrewsbury Water Supply.—In view of the very decided opinion expressed at the recent meeting of ratepayers in opposition to the Bill of the Shrewsbury Corporation, by which they desired to be empowered to obtain a fresh supply of water for the borough from the River Severn, it was agreed at the meeting of the Corporation last Tuesday, on the recommendation of the Gas, Water, and Lighting Committee, to withdraw the demand for a poll which the promoters of the scheme made at the meeting; and therefore the Bill will not be proceeded with.

The Leeds Corporation and Electric Lighting.—The *Yorkshire Post* is anxious to learn what the Leeds Corporation are doing in the matter of electric lighting for the borough. A few days since, our contemporary recalled to mind the fact that, when the Corporation had resolved to shelve the subject, as far as any active operations on its own account were concerned, it amalgamated the Parliamentary, the Electric Lighting, and the Highways' Committees, and charged them with the duty of keeping an eye upon the project of the three Companies who are applying for leave to supply Leeds with the electric light. It seems to be months since the Electric Lighting Committee met; and the combined Committees also appear to be indifferent. Feb. 1 is the last day on which objections may be lodged against the applications of the Companies; but so far the Corporation does not appear to consider what line it is to take in the matter. Even the little preliminary undertaking that was sanctioned by the Council for illuminating the Town Hall and Municipal Buildings, at a cost of £3000 or so, seems to be hanging fire, or to be taking practical shape so slowly that, before it is completed, the whole of Central Leeds may outshine the two official edifices where electricians have been tinkering for a year or two. A meeting of the Electric Lighting Committee was held last Thursday (after the publication of the foregoing), when it was arranged to call a special meeting of the Parliamentary Committee for yesterday, at which the Highways and Electric Lighting Committees were asked to be present, to consider the subject.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday*.

Dundee does not want electric light. What the newspapers call a discouraging report, but which is discouraging only according to the standpoint from which it is looked at, was submitted to a Committee meeting on Wednesday, with regard to the canvass of the proposed compulsory area. Consumers of gas to the amount of £5 and upwards a year, of whom there were 264 within the area, and whose gas rental last year amounted to £5984, were consulted as to their intention, or the reverse, to adopt electric light if it were introduced. Of the 264 only 147 replied to the circular of the Committee, representing a gas rental of £3013; and of the 147, only 41, with a gas rental of £787, were in favour of the electric light, while the remaining 106, representing a rental of £2226, were opposed to it. The Committee resolved to report the outcome of the canvass to the different bodies which elected them, before going further. Dr. Hopkinson and Professor Ewing recently reported to the Committee that electricity might cost 1½ times the price of gas, which would, according to the above figures, mean a revenue of about £1180 in the compulsory area; and as the former of those gentlemen estimated the annual charge for supplying the light at from £4300 to nearly £7000, it is evident that without the promise of a great deal more support, it is futile for either the Corporation or anybody else to attempt in the meantime to introduce electric lighting into Dundee.

North Berwick is at present haggling over a proposal to extend the gas-works; the objection to this otherwise unobjectionable step being that the town is a summer resort, and the works being beside the railway station, visitors are apt to receive at first a bad impression of the place. It was proposed that the Gas Company should remove their works to another site; but, of course, this was too costly a thing for the Company to do merely in deference to an idea. The notion was then entertained that the town might acquire the gas undertaking; and inquiries in that direction were instituted. The result of these is reported to be that if a transfer were effected, the Police Commissioners might conduct the undertaking so as to effect a saving of £300 a year to the community. This I very much doubt. Had the Police Commissioners been so convinced, they would show some eagerness to take over the undertaking of the Company. Instead of that being the case, however, they have, of all things in the world, begun coquetting with a London firm for the lighting of the town with electricity. My opinion is that their intention is to bring pressure to bear upon the Gas Company, so that they may the more easily effect either a transfer to themselves, or the removal of the works to another site. Whether or not that be their intention, the Police Commissioners took a dangerous step on Thursday night when they agreed to consent to the London firm applying for a Provisional Order, even although that consent is to be given with a proviso that they should beforehand come to satisfactory terms for the new light. In the hands of skilful Parliamentary Agents, they may find this consent twisted into something they did not anticipate; and besides landing themselves in an expensive parliamentary contest, which a small place like North Berwick is ill able to bear, they may find themselves saddled with a system of lighting much more costly than they at present contemplate.

One of those periodic outbursts of vigilance which occasionally agitate public boards seems to have swept over Kirkcaldy Police Commission in the matter of the quality of the gas supplied to the town. In their new-born zeal for the public welfare, they considered it essential that the gas should be tested; and inquiries were ordered to be made as to how that could be done. But a damper was thrown upon their conscientious aspirations when, at Monday night's meeting of the Commission, it was reported that it had been ascertained from Mr. Milne, of Edinburgh, that testing apparatus would cost more than £70, and would, moreover, require a dark room to be provided for its reception. This was too much outlay to face, which shows that the Commissioners had not entertained very great suspicions regarding the quality of their gas. As an honourable way out of the difficulty, it was suggested by a member of the Commission that, as the Gas Company possessed testing plant, they would doubtless be quite willing to allow the Commissioners to be present at the testings; and a Committee was appointed to try and arrange for something being done in that direction. The Company may agree to the proposal; but assuredly one of the members did not help towards that end when he threw doubt upon the statement of the Company that the gas supplied was equal to 29½ candles.

Is there natural gas in Scotland? From a paper read by Mr. Hugh Miller before the Royal Physical Society in Edinburgh on Wednesday night, it would appear that a gaseous substance, the nature of which has not yet been determined, has been found at the surface of the ground at Strathpeffer. He stated that two-and-a-half years ago a curling pond was made in the grounds of Fairbairn Castle; but when the winter came the ice was found to be useless for skating, through bubbles which were formed in it. When these were broken, there was a hiss, as of escaping gas, which ignited with explosive force when a light was brought to it. Means had been taken to sample the gas, the exhalations of which seemed now to be getting less, and he suggested that a constituent element in it was marsh gas, probably mixed with nitrogen, carbonic acid, and other elements. This, to be sure, does not give ground for the large hope of a commercial product being found; but in view of the circumstance that this gas was got at the surface, the possibility need not be excluded of something more profitable being reached by boring if it were resorted to.

From our Glasgow Correspondent.

GLASGOW, *Saturday*.

Yesterday afternoon an extraordinary general meeting of the shareholders of the Partick, Hillhead, and Maryhill Gas Company was held in Glasgow. The chair was occupied by Mr. Henry Cowan, Chairman; and there was a large representation of the shareholders. The special object of the meeting was the consideration of the Bill which it is proposed to introduce into Parliament in the ensuing session, the chief purposes of

which are to incorporate and confer powers on the Partick, Hillhead, and Maryhill Gas and Electricity Company, and to define the respective districts of gas supply of the Corporation of Glasgow and the Company, and, if so resolved, to pass a special resolution approving of the Bill, subject to all such additions, alterations, and variations as Parliament may think fit to make in the same. Some questions were asked and answered, and eventually the resolution was unanimously adopted. It seems that both the Corporation of Glasgow and the Gas and Electricity Company are preparing for a regular stand-up fight in Parliament. In the event of statutory powers not being conceded to the Company, they will claim, I believe, that their whole concern must be taken over by the Corporation at a price to be fixed by arbitration.

On Wednesday, in the Faculty Hall, Glasgow, 60 £1 shares in the Kilmalcolm Gas Company were disposed of by public auction at 25s. per share. There were likewise exposed for sale 50 £1 shares in the Langbank Gas Company, the price realized being only 20s. 6d. each.

When the revenue derived from the sale of the residual products was last reported on to the Glasgow Corporation Gas Committee, it was stated that for a period of six months of the financial year 1889-90 it amounted to £32,699 14s. 3d., as compared with £27,319 4s. 8d., thus showing an increase of £5380 9s. 7d.

The report by Mr. Foulis on the disturbance and deviation of gas-mains consequent upon the construction of the Glasgow Central (Underground) Railway, shows that in one place a main of 48 inches in diameter will require to be diverted over a stretch of about 700 yards. It is this main that conveys the whole of the gas from the Dawsholm Gas-Works into the city. In another place a 24-inch main will require to be lifted and diverted over a length of 170 yards.

I do not think I have yet mentioned that the professional assistance of Mr. R. E. Crompton, of Chelmsford and London, has been specially secured on behalf of the Corporation of Glasgow in reference to electric lighting matters. I may here mention that Mr. Crompton was much concerned with electric lighting in this city some nine or ten years ago —in the early days of the "llght of the future." He also took a prominent part in the Philosophical Society's Exhibition of Gas and Electric Lighting Appliances which was held in the year 1880.

It is with extreme regret that I have to announce the death of Mr. James Stewart, of the firm of A. and J. Stewart, manufacturers of malleable iron tubes for conveying gas, steam, hot air, water, &c. He had been in such indifferent health that he had not been able to take part in the business of the firm for a period of at least six months. In connection with the Clyde Tube Works, he had been prominently identified with Coatbridge during the last quarter of a century. A gentleman of great intelligence and affable manners, he was a universal favourite amongst the numerous employes of the different departments of his firm's extensive business, as well as of the customers and all other persons with whom he came into contact. He was well and favourably known amongst gas managers, especially in Scotland; and the reputation of his firm stands high in all parts of the world.

Another death falls to be recorded this week. It is that of Mr. Frank Baker, chemical analyst to the Gas Residual Products Company, Irvine. He had lately come from Manchester to carry out some special investigations for that Company, which were progressing most successfully. Mr. Baker was found dead in his bed on Thursday morning; the death resulting, however, from natural causes. He was about forty years of age; and was much liked on account of his cheerful and gentlemanly manner.

The new reservoir at Craigmaddie, forming an important portion of the extensions of the Glasgow Corporation Water-Works, is making rapid progress towards completion. It will hold about 700,000,000 gallons of water—14 days' supply at the rate of 50,000,000 gallons per day. The present consumption is about 40,000,000 gallons per day.

The Glasgow pig iron market has been irregular during this week. Scotch warrants have fluctuated in price between 60s. 4½d. and 62s. 11d. per ton, the close yesterday being 61s. 1d. The stock of Scotch iron in the public warrant storeshas now decreased to 919,930 tons.

A considerable amount of firmness continues to show itself in the local coal trade; and in some quarters another advance in miners' wages has been announced.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 18.

Sulphate of Ammonia.—Notwithstanding the energetic attempts to prove the contrary, it must be clear to the most disinterested spectator that the present impact in sulphate prices is entirely due to the action of "bear" speculators, who in vain try to cloak their own position by pointing to the indifference of German buyers, the reticence of Belgian and French consumers, the low prices in Paris, &c., as being the chief causes of the present dulness in our market. It seems to be one of the principal tactics of many of the modern votaries of commerce, to dissemble as much as possible, and to throw dust in the eyes of those supposed to be less informed than their aggressors. But in making assertions in print, stronger proofs are required than mere verbosity; and it is absurd to put forth unsupported statements, that sulphate is to come to the level of £11 10s. in the spring, because this happened—not last year—but about three seasons ago. Sulphate opened at £12 10s. in January of last year; and with moderate fluctuations (touching £11 17s. 6d.) was still at £12 in May. Nitrate, on the other hand, was quoted at 11s. 3d. in January, and gradually fell to 8s. 4½d. in May. Hence sulphate suffered to the extent of 10s. per ton only, while nitrate lost £3 per ton; *and this position was maintained to the end of* 1889. It is therefore during eight months that consumers had their choice between the cheap nitrate and the reputedly high sulphate; and they chose the latter, as the large demand from all quarters proved. Why should buyers draw the line at sulphate now, especially in view of an excessively wet season, which forbids the use of nitrate? The real position is this: In December, and at the beginning of this month, nearly all dealers and speculators, in view of the dull nitrate market, took large orders from foreign and home consumers below the then prevailing market values. To make the business pay, it was imperative that sulphate prices should come down; and by disseminating reports of the weakness of the market on this side, foreign buyers were induced to stand aloof, leaving the operators masters of the position. To succeed in their plans, speculators may go on taking the orders; but there may be means by which makers can thwart these doings. The latter make themselves responsible for lower prices, if they force their parcels on the market at inopportune moments. The bulk of the January production seems now to be sold, and pressure on the market may easily be avoided. To-day's quotation at the various ports is £12.

LONDON, *Jan.* 18.

Tar Products.—There has been more activity in this market during the week; and benzoles are again firmer. A good deal of inquiry is going on for anthracene; but the prices asked do not tempt buyers, particularly for forward business. There is no doubt a better consumption of this article; but the low price of alizarine will not admit of the present prices of anthracene. Makers were never so clear of stocks of anthracene as they are to-day; while continuous applications of alizarine for new purposes goes on. Pitch is not quite so firm; but makers are well sold for the season. Prices: Tar, 25s. to 30s. per ton, according to position. Benzol, 90 per cent., 3s. 8d. per gallon; 50 per cent., 2s. 10d. per gallon. Toluol, 2s. per gallon. Solvent naphtha, 2s. per gallon. Pitch, 30s. to 35s. per ton, according to position. Crude naphtha, 1s. 4d. per gallon. Light oil, 4½d. per gallon. Lucigen creosote, 3d. per gallon. Ordinary creosote, 2½d. per gallon. Carbolic acid, 3s. 2d. per gallon. Anthracene, nominal (30 per cent.), "A" quality, 1s. 4d. per unit; "B" quality, 1s. 2d.

Ammonia Products.—The heavy make of sulphate is just now tapering off; and manufacturers have had no difficulty in disposing of their produce at £12. There is not much new business offering; but stocks are low. Owing to large contracts made at the end of last year, makers have very little unsold. Muriate of ammonia has advanced £1 per ton; and both carbonate and liquid are stronger than last week. Other prices remain as before.

Stockton and Middlesbrough Water Board.—At the monthly meeting of the Stockton and Middlesbrough Water Board yesterday week, the following payments were ordered to be made to the Joint Corporations out of the net revenue:—Middlesbrough, £9000; Stockton, £7500; and South Stockton, £1500.

The Warrington Corporation and the Proposed Purchase of the Water-Works.—It is stated that the Corporation of Warrington contemplate the withdrawal of the Bill which they have lodged for the extension of the borough, and amongst other purposes, the purchase of the undertaking of the Warrington Water Company. The purchase clauses are at any rate very unlikely to be proceeded with.

Lymm Water Supply.—With the view of meeting the requirements of the whole of the Lymm district, considerable extensions are being carried out by the Lymm Water Company. The buildings for the necessary plant have been erected, a new boiler of 20-horse power has been put down, in addition to the present one of the same capacity, and preparations are being made for the reception of the engine and pumps. It is expected that, in about twelve months' time, the whole of the district will be supplied with water.

The Condition of the Plympton Water Supply.—The efforts of the Medical Officer of Health (Mr. G. H. Adkins) to obtain an inquiry into the water supply of the Plympton district (to which we referred in the JOURNAL for the 24th ult., p. 1216) have been justified by the reports of the Committee appointed, on his suggestion, at a recent meeting of the Rural Sanitary Authority. These showed that he had not exaggerated the unsatisfactory character of the present supply from wells, and they afforded abundant evidence of much illness having occurred, such as might be produced by the use of impure water. The Committee were of opinion that steps should be taken, without delay, to provide the district with an improved water supply. The Sanitary Authority have decided to call a meeting to consider the matter.

Inauguration of the Barry and Cadoxton Gas-Works.—The close of the past year witnessed the completion of the gas portion of the undertaking of the Barry and Cadoxton Gas and Water Company; and the inhabitants of the district are now in the enjoyment of all the advantages attendant upon a good supply of gas. The works were designed by Mr. F. M. Harris (formerly of Falmouth), the Engineer and Secretary of the Company; and they are equal to the production of half a million cubic feet of gas per day—arrangements having been made for large extensions when called for. Messrs. John Aird and Sons were the contractors for the excavations, buildings, and mains; Messrs. R. and J. Dempster supplied the retort-house plant and the engines, exhausters, and pumps; Messrs. C. and W. Walker put up the holder and the condensing and purifying appliances; and Messrs. W. and B. Cowan supplied the station meter, governor, &c. There appears to be every prospect of this undertaking developing, and becoming very successful.

The Wakefield Corporation Water Committee in a Dilemma.—At the monthly meeting of the Wakefield City Council last Tuesday, a long and warm discussion took place relative to the arrangements between the Water Committee of the Corporation and Mr. Bartholomew, the Engineer to the Aire and Calder Navigation Trustees, with reference to the terms on which the Corporation shall carry new water-mains over a private bridge at Stanley Ferry, belonging to the Trustees, in order to supply water to the districts of Normanton, Featherstone, and Castleford. Mr. Fernandes, the newly-appointed Chairman of the Water Committee, pointed out that the late Committee laid a main on each side of the bridge without having previously obtained permission, upon which a communication was received from Mr. Bartholomew stating that he would require the Corporation to pay a considerable sum of money for the privilege, and also an additional sum to be paid annually according to the quantity of water which passed through the mains. Subsequently the demand was reduced to £500, and afterwards to £350. It was for the Council to say whether they would take up the mains which had been laid on both sides of the bridge at great cost, and adopt another route, or accede to Mr. Bartholomew's demands. He concluded by proposing that the matter should be referred to the Water Committee to make such arrangements as they deemed most expedient and satisfactory under the circumstances. Alderman Lee seconded the motion, which was eventually carried.

The Proposed Storeage Reservoir for Plymouth.—At the meeting of the Plymouth County Council last Wednesday, the resolution passed on Nov. 7 last, authorizing the Council to promote a Bill with the object of constructing a storeage reservoir at or near the junction of Harter Brook with the River Meavy, and giving them enlarged powers in connection with the water undertaking, was confirmed.

The Accident at the Saltley (Birmingham) Gas-Works.—The members of the Birmingham Fire Brigade intend to show their appreciation of the courage of Richard Smith, who distinguished himself by his laudable efforts to save his fellow-workmen from peril in connection with the sad event which recently occurred during the repair of a holder at the Saltley Gas-Works, by presenting him with a silver medal.

The Purchase of Additional Land for Gas-Works Purposes at Leeds.—When the Leeds Town Council, at their meeting on New Year's Day approved of the purchase by the Gas Committee of two lots of land contiguous to the Meadow Lane Gas-Works, comprising 24,368 square yards, at 7s. a yard (*ante*, p. 26), some of the members expressed an opinion in favour of also buying an adjoining plot. The Gas Committee have had the suggestion under consideration; and at their meeting last Thursday, it was decided to purchase the additional plot, which consists of about 11,000 square yards, for £4200.

Elloughton (East Yorkshire) Water Supply.—Last Wednesday, Mr. Codrington, one of the Local Government Board Inspectors, held an inquiry at Elloughton with respect to the water supply of the locality. The evidence put before the Inspector showed that the present sources of supply were of a questionable character; and the proposal of a Committee of ratepayers was to procure by means of gravitation water from a spring in Elloughton Dale. The Rural Sanitary Authority were satisfied that a better supply of water was necessary; but they were chary about putting into effect their own powers. The Inspector thought this was a matter for the Rural Sanitary Authority.

An Electric Lighting Company for Birmingham.—The Provisional Order which Messrs. Chamberlain and Hookham obtained, giving them power to supply electricity throughout the principal streets of Birmingham, has been purchased for £3000 by Messrs. Holmes and Vaudrey, of the Liverpool Electric Supply Company; and a Company, with a nominal capital of £100,000 in 20,000 shares of £5 each, has been formed to carry out the objects of the Order. It is understood that one-fourth of the necessary capital has been promised, and that arrangements have already been made to construct and equip a central station capable of supplying light for 10,000 lamps. This will be done at an outlay of £30,000. The prospectus was published last Saturday.

Fatal Accident at the Festiniog Gas-Works.—Last Thursday, an inquiry was held at Festiniog, North Wales, into the circumstances attending the death of Mr. David Morgan, Manager of the Blaenau Festiniog Gas-Works, which occurred on the previous Tuesday. Evidence was given to the effect that the deceased, assisted by a workman named Hughes, was endeavouring to increase the pressure of gas in the town by sending it into the mains direct from the holder, when there was a large escape, which rendered both men insensible. Mr. Morgan was asphyxiated, and Hughes had a narrow escape—all efforts to resuscitate him for a long time proving futile. The jury returned a verdict of "Accidental death." Mr. Morgan has left a widow and family.

Castleford Water Supply.—An inquiry was held last Thursday by Mr. Codrington, on behalf of the Local Government Board, into an application by the Castleford Local Board for power to borrow £4000 for the purpose of obtaining an adequate supply of water for the district. Mr. Farquhar, the Chairman of the Local Board, stated that 20 years ago Castleford carried out a water scheme at a cost of £15,000, which supply failed three years ago. Later on a supply of water was secured from a neighbouring township; and this being recently declared by eminent analysts as unfit for drinking purposes, the Board now desired to borrow money, in order to obtain a supply from the Wakefield Corporation, although they were still indebted on the old scheme to the amount of £9000. To make up this deficiency, it was intended to advance the price to cottage property from 2d. to 4d. per week. To this proposal there was some opposition on the part of owners of cottage property.

The Dewsbury and Heckmondwike Water Bill.—A special meeting of the Heckmondwike Board of Health was held last Thursday, for the purpose of considering what course to take in the matter of the difference between the Dewsbury Corporation and the Board on the water-works question (*ante*, p. 33). The matter was thoroughly discussed; the idea of creating a common fund respecting all water sold immediately outside the boundaries (defined at the time the water-works partnership was entered into) meeting with entire approval. It was unanimously decided to ask the Dewsbury Corporation to allow the Bill now before Parliament to lapse for the present, with a view of an amicable settlement of the present differences being arrived at during the ensuing year. A further resolution was agreed to, authorizing the Clerk to take all necessary steps for putting the Board in a position to oppose the Bill, in the event of the Dewsbury Corporation not complying with the Board's wish.

Northern Coal Trade.—There has been a better output at the northern coal mines during the past three or four days; and the recommencement of work in Belgium has set free coal that might otherwise have been sent to that country, so that there is more coal for shipment. Northumbrian steam coal is now selling freely at about 13s. 6d. free on board in the Tyne; but while this is the case, there is much coal being delivered on old contracts at about 10s. to 11s. per ton. Gas coal is still in large demand; though less is now being used locally, yet the exports are beginning to increase—large quantities of gas coal being sent to Lisbon, especially. The price varies; but for immediate shipment, about 15s. free on board is the current quotation. As far as can be learnt, the introduction of electric lighting has not affected the consumption of gas, though there is the decrease in consumption usually known when the middle of January has passed. Manufacturing coal is very firm; and high prices have had to be paid to ensure delivery. Bunker coal for steamships is easier. Household coal is dull; the warm weather lessening the use.

Bankruptcy of Mr. T. Wilkinson.—The first meeting of the creditors of Mr. T. Wilkinson, the Manager of the Newmarket Gas-Works, was held last Thursday. The Official Receiver (Mr. J. Ellison) stated that the total of the claims was £642; the admitted claims being £610. The assets amounted to £177 18s. The debtor explained that the cause of the deficiency was long and continued illness in his family, fourteen in number. A trustee and committee were appointed.

The New Water-Works for the Rhondda.—The members of the Ystrad Local Board are greatly alarmed at the proposal contained in the Bill of the local Water Company to construct a dam just above the Bwllfa Colliery, or on the mountain side near Ton, to retain about 8 million gallons of water. At the meeting of the Board last Friday week, the Chairman (Mr. W. Jenkins) and the Surveyor portrayed a very terrible state of things if the embankment should collapse; and the latter also gave it as his opinion that the reservoir was absolutely unnecessary. The question was eventually postponed for a fortnight, when the Board will, it is stated, further consider it, and request the ratepayers of the district to convene public meetings in various localities to deliberate upon the subject.

The Bankruptcy of Mr. T. W. Stears.—On Monday last week, Mr. T. W. Stears, Gas Engineer, of Hull, appeared before the Registrar (Mr. T. Farrell), at the Hull County Court, for his public examination. Among the creditors were the Mablethorpe Gas Company. In reply to the Official Receiver (Mr. Forder), the debtor said that his liabilities were £3876; assets £1743, less preferential debts £211; leaving a deficiency of £2345. The cause of his insolvency was ill-health, and inability to sell shares of which he was possessed. In answer to Mr. Thorney (who appeared for the Trustee) the debtor said he had floated a Company at Crossgates, one at Mablethorpe, another at Pocklington, and others elsewhere. The Crossgates Company brought an action against him in July last; and ultimately presented a petition in bankruptcy. As to the Mablethorpe Gas Company, he was contractor and engineer for them. Before the Company was formed, he entered into a contract to erect the works. By the accounts, it appeared that the bankrupt had received £6932, and that his total claim was only £4854; but he denied that he owed the Company anything, and asserted that they owed him money. The examination was adjourned for the production of accounts and cash-book.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

For Stock Market Intelligence, see *ante*, p. 102.

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	16 Oct.	10½	Alliance & Dublin 10 p. c.	10	17—18	..	5 16 8
100,000	10	,,	7½	Do. 7 p. c	10	12½—13½	..	5 11 1
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	108—110	..	4 10 11
100,000	20	28 Nov.	8	Bahia, Limited	20	19½—20½	..	7 16 1
200,000	5	14 Nov.	7½	Bombay, Limited	5	6½—6¾	..	5 11 1
40,000	5	,,	7½	Do. New	4	4¾—5¼	..	5 17 10
380,000	Stck.	14 Aug.	12½	Brentford Consolidated	100	218—223	..	5 9 10
125,000	,,	,,	9½	Do. New	100	158—163	..	5 13 6
220,000	20	12 Sept.	11	Brighton & Hove, Original	20	41—43	..	5 2 4
320,000	20	27 Sept.	11½	British	20	43—45	..	5 0 0
50,000	10	12 Sept.	11	Bromley, Ordinary 10 p. c.	10	19—21	..	5 4 9
39,000	10	,,	8	Do. 7 p. c.	10	13—15	..	5 6 8
328,750	10	14 Nov.	10	Buenos Ayres (New) Limited	10	13—14	..	7 2 10
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	107—110	..	5 9 1
150,000	20	14 Aug.	8	Cagliari, Limited	20	25—27	..	5 18 4
550,000	Stck.	16 Oct.	13½	Commercial, Old Stock	100	244—249	+2	5 10 5
130,000	,,	,,	10½	Do. New do.	100	195—200	..	5 7 6
130,000	,,	30 Dec.	4½	Do. 4½ p. c. Deb. do.	100	117—122	..	3 13 9
557,320	20	12 Dec.	13	Continental Union, Limited	20	47—48	..	5 8 4
242,680	20	,,	13	Do. New '69 & '72	14	32—34	..	5 6 7
200,000	20	,,	10	Do. 7 p. c. Pref.	20	37—39	..	5 2 6
75,000	Stck.	27 Sept.	10	Crystal Palace District	100	200—205	..	4 17 7
234,060	10	26 July	13	European, Limited	10	23—25	+1	5 4 0
120,000	10	,,	13	Do. New	7½	17—18	..	5 8 4
354,060	10	,,	13	Do. do.	5	11—12	..	5 8 4
5,470,040	Stck.	14 Aug.	13¾	Gaslight & Coke, A, Ordinary	100	248—253	−1	5 8 8
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	100—105	..	3 16 3
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	252—257	+2	3 17 9
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	123—128	..	3 18 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	182—187	..	4 0 4
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	160—165	+2	4 4 10
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	248—253	..	3 19 0
1,061,150	,,	12 Dec.	4	Do. 4 p. c. Deb. Stk.	100	112—115	..	3 9 7
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	121—125	..	3 12 4
650,000	,,	,,	6	Do. 6 p. c. do.	100	160—170	..	3 10 7
3,800,000	Stck.	14 Nov.	12	Imperial Continental	100	213—218	..	5 10 1
75,000	5	12 Dec.	6	Malta & Mediterranean, Ltd.	5	5—5¼	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	113—115	..	4 6 11
541,920	20	28 Nov.	6	Monte Video, Limited	20	18¾—19¾	..	6 3 1
150,000	5	28 Nov.	10	Oriental, Limited	5	8¾—9	..	5 11 1
60,000	5	27 Sept.	7	Ottoman, Limited	5	5¾—6¼	..	5 12 0
166,870	10	26 July	4	Pará Limited	10	3¾—4¼	..	8 17 9
				People's Gas of Chicago—				
420,000	100	2 Nov.	6	1st Mtg. Bds.	100	100—105	..	5 14 3
500,000	100	2 Dec.	6	2nd Do.	100	95—100	..	6 0 0
100,000	10	16 Oct.	10	San Paulo, Limited	10	14¾—15¾	..	6 9 2
500,000	Stck.	29 Aug.	16½	South Metropolitan, A Stock	100	295—305	..	5 6 6
1,350,000	,,	,,	12½	Do. B do.	100	228—233	..	5 4 1
141,500	,,	,,	13¾	Do. C do.	100	240—250	..	5 6 0
600,000	,,	30 Dec.	5	Do. 5 p. c. Deb. Stk.	100	135—140	..	3 11 5
60,000	5	12 Sept.	11½	Tottenham & Edm'nton, Orig.	5	11—13	..	4 8 5
				WATER COMPANIES.				
728,446	Stck.	30 Dec.	9½	Chelsea, Ordinary	100	260—265	..	3 11 8
1,720,560	Stck.	16 Oct.	7½	East London, Ordinary	100	211—215	..	3 9 9
544,440	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	143—148	..	3 0 10
700,000	50	12 Dec.	9	Grand Junction	50	125—130	..	3 9 3
708,000	Stck.	29 Aug.	10½	Kent	100	276—281	..	3 14 9
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	100	252—256	+1½	3 14 2
406,200	100	,,	7½	Do. 7½ p. c. max.	100	197—202	..	3 14 3
200,000	Stck.	27 Sept.	4	Do. 4 p. c. Deb. Stk.	100	124—128	..	3 2 6
500,000	100	14 Aug.	12½	New River, New Shares	100	364—369	..	3 5 8
1,000,000	Stck.	26 July	4	Do. 4 p. c. Deb. Stk.	100	128—131	..	3 1 0
902,300	Stck.	12 Dec.	6	S'thwk & V'xhall, 10 p. c. max.	100	165—170	−2	3 10 7
126,500	100	,,	6	Do. 7½ p. c. do.	100	163—168	..	3 11 5
1,155,066	Stck.	12 Dec.	10	West Middlesex	100	260—265	..	3 15 6

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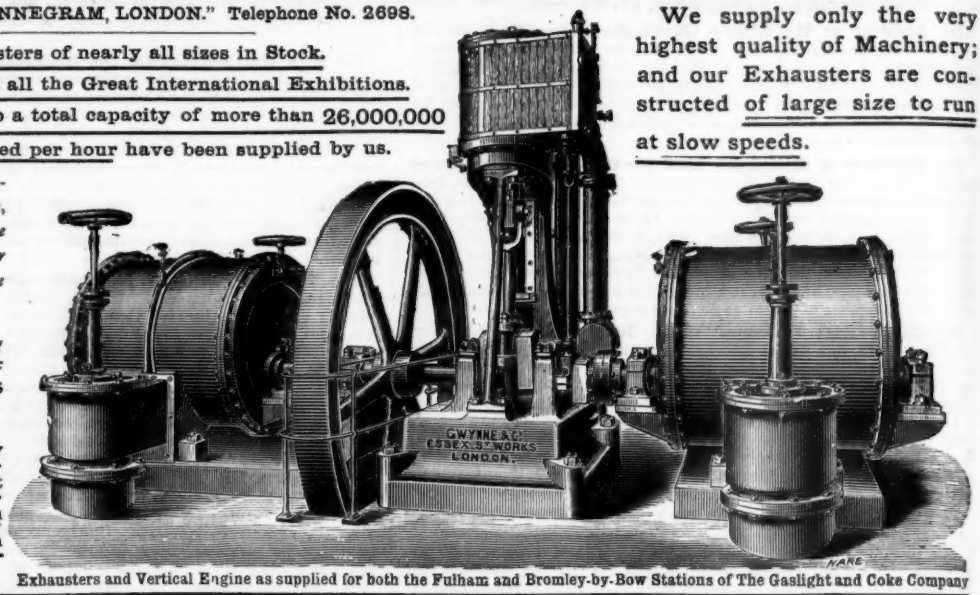

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WANTED, a practical Gas-Fitter. Must be well up in the Laying of both Iron and Compo. Pipes, Fixing Meters, Stoves, &c.; also able to do ordinary Repairs to Meter Cases and Floats, to Test Meters and Lamp Governors, and make himself useful about the Works. Constant employment to a suitable man. Sobriety and good character indispensable.
Apply, in own handwriting, stating age and wages expected, accompanied by not more than three copies of recent testimonials, to the undersigned, not later than Friday, the 31st inst.
JOHN SMITH, Manager.
Gas-Works, Bangor, North Wales,
Jan. 17, 1890.

TIMMIS & CO., of STOURBRIDGE Make only the best quality of FIRE-CLAY RETORTS, BRICKS, TILES, & LUMPS. Also SPECIAL SILICA BRICKS, to stand great heats. All descriptions kept in Stock.
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WANTED, a Working Foreman, com- petent to lay Mains and Services, to take Indices of Meters, and to make himself generally useful on the Works, &c. Wages 30s. per week, with House, Coals, and Gas free.
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COLNE AND MARSDEN LOCAL BOARD.

WANTED, an Engineer and Manager to take charge of the Gas-Works. The person appointed must have a thorough, practical knowledge of the Manufacture and Distribution of Gas, the Laying of Main and Service Pipes, and be competent to prepare Plans, &c., and carry out new Works.
The make of Gas is about 60 million feet per annum.
Applications, stating age, &c., and salary required, with not more than three testimonials of recent date, to be forwarded to the undersigned, endorsed "Gas Manager," not later than the 10th of February, 1890.
ALFRED VARLEY,
Clerk to the Board.
Local Board Offices, Colne, Jan. 14, 1890.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased.
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Apply, with testimonials, to the MANAGER, Gas-Works, Romsey, HANTS.

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WANTED, an Experienced Engineer and MANAGER to take charge of the Gas-Works. He must have a thorough scientific and practical knowledge of the Manufacture and Distribution of Gas, and the Manufacture of Sulphate of Ammonia. He must also understand Regenerative Heating, and possess a practical acquaintance with Main and Service Laying. He must be competent to design and prepare plans for, and carry out all constructive works and alterations that may be required. His whole time must be devoted to the duties of his Office. He must not be under 25, nor more than 45 years of age.
The Office will be held subject to Three months' notice on either side.
The make of Gas is about 300 million feet per annum.
Applications, stating age, qualifications, present employment, and amount of salary required, together with not more than three recent testimonials, must be sent to the undersigned not later than the 22nd of January, 1890, endorsed "Gas Manager."
Any applicant canvassing will be disqualified.
GEORGE BAINBRIDGE, Town Clerk.
Municipal Buildings, Middlesbrough,
Dec. 24, 1889.

NORTHAMPTON GAS-WORKS.

THE Directors are prepared to receive TENDERS for a set of PURIFIERS, 30 feet by 25 feet, complete, according to Drawings and Specification which may be seen at the Office of the Company, Northampton, on and after Monday, the 20th inst.
Copies of the Specification, and Form of Tender, may be had on payment of One Guinea, which will be returned on receipt of a *bond fide* tender.
Copies of the Drawings may be had on payment of the cost.
Tenders, addressed to the Chairman, to be delivered at the Office of the Gas Company, on or before Tuesday, Feb. 4.
The Directors do not bind themselves to accept the lowest or any tender.
By order,
JOHN EUNSON, Engineer.
Gas-Works, Northampton, Jan. 6 1890.

FOR SALE—Single Gasholder, 60 feet diameter by 28 feet deep. Capacity, 65,000 cubic feet; fixed complete; in good condition.

Also one Single GASHOLDER, 80 feet by 20 feet deep, ten Cast-Iron Columns and Wrought-Iron Girders.

Also four PURIFIERS in a group, 16 ft. by 12 ft. by 8 ft. 9 in. deep; 12-inch Centre-Valve and Connections.

Would erect the above, and make practically equal to new.

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COMBINED ENGINE AND EXHAUSTER.

THE Widnes Local Board are prepared to receive TENDERS for the supply of a COMBINED ENGINE and EXHAUSTER; the Exhauster to be of the Rotary Type, with a capacity of 40,000 cubic feet per hour.

Conditions of contract and other particulars may be obtained upon application to Mr. Carr, Gas-Works, Widnes.

Tenders to be endorsed "Engine," and to be delivered to the undersigned before noon on Monday, the 3rd of February.

The Board do not bind themselves to accept the lowest or any tender.

JAS. T. ALLEN, Clerk.

Town Hall, Widnes, Jan. 15, 1890.

COUNTY BOROUGH OF SALFORD.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of RETORTS and FIRE-BRICKS required at their various Works.

Full particulars and forms of tender may be obtained on application to the Gas Engineer, Gas Offices, Bloom Street, Salford.

Sealed tenders, endorsed "Tender for Fire-Clay Goods," addressed to the Chairman of the Gas Committee, to be sent to my Office not later than Five p.m., on Thursday, the 23rd inst.

By Order,

SAML. BROWN, Town Clerk.

Town Hall, Salford, Jan. 15, 1890.

C. & W. WALKER.

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Offers, endorsed "Tender for Edinburgh Works' Residual Products," or "Tender for Leith Works' Residual Products," will be received by the Subscriber on or before Saturday, the 8th of February next.

The Commissioners do not bind themselves to accept the highest or any tender.

JAMES M'G. JACK, Clerk.

25, Waterloo Place, Edinburgh,
Jan. 13, 1890.

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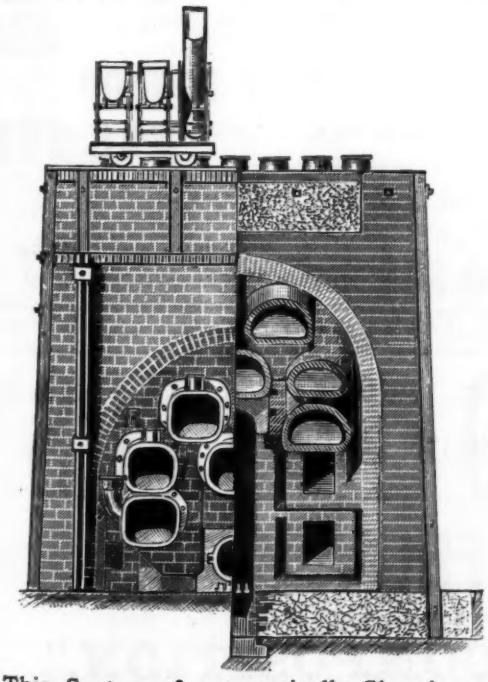

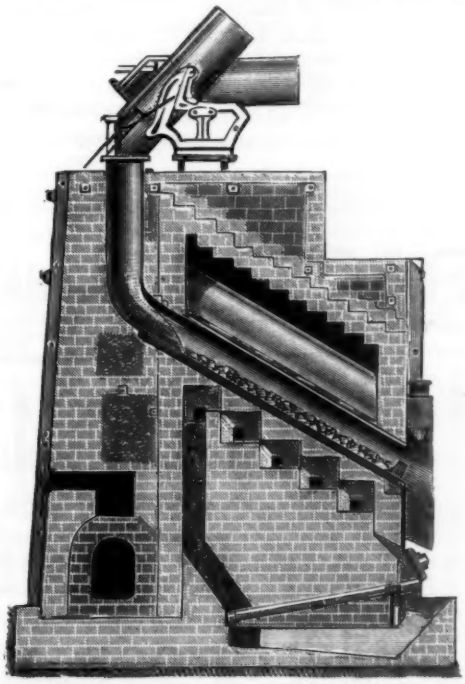

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PIPES and CONNECTIONS, 1½ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE. — Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

THOMAS TURTON AND SONS, LIMITED,
Sheaf & Spring Works,
SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.
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ANTI-RED LEAD
(SCOLLICK'S PATENT).

This jointing Mastic far supersedes Red and White Lead, and is 30 per cent. cheaper. It has been, and is being supplied to The Gaslight and Coke Company's Beckton, St. Pancras, and Kensal Green Stations; and to show that it gives satisfaction, ten orders have been received from Beckton during this year. Amongst other Works it has been supplied to Vauxhall, South Shields, Sheffield, Maidstone, Walton, &c., &c.

Circulars and full particulars on application to the Sole Agents—
S. CHANDLER & SONS,
KENNINGTON OVAL.

TROTTER, HAINES, & CORBETT,
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FIRE-CLAY & BRICK WORKS,
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Manufacturers of GAS-RETORTS, GLASSHOUSE, FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

CAST-IRON PIPES
FOR GAS AND WATER.
VALVES
FOR GAS, WATER, AND STEAM.

TELEGRAMS: "PIPES GLASGOW."
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Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
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TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

For Prices and complete Analysis, apply to
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COAL OWNERS, NEWCASTLE-ON-TYNE.
Or E. FOSTER & CO. 21, John St., Adelphi, LONDON, W.C.

Scores of Testimonials can be had on application, and references can be given to Colliery Owners, Engineers, Gas-Works, Iron-Works, Glass-Works, Shipowners, Cotton Mills, Paper Mills, Woollen Mills, Brewers, Dyers, Printers, and in fact to Steam Users in every Branch of Trade.

OVER 1500 BOILERS
KEPT FREE FROM SCALE
BY THE USE OF
"CROSBIE'S COMPOSITION."

ADOLPHE CROSBIE,
WALSALL STREET CHEMICAL WORKS,
WOLVERHAMPTON.

Sold in 5 cwt. Casks at 18s. 6d. per cwt., carriage paid. Sample Drums at 20s. per cwt.

WATER GAS FUEL GAS

FOR INDUSTRIAL PURPOSES

GENERATED FROM

BITUMINOUS SLACK COAL

BY THE

LOOMIS PROCESS.

The Cheapest Gas-Generating System in the World.

NOVEL IN DESIGN.
MODERN IN CONSTRUCTION.
SIMPLE IN OPERATION.
PERFECT IN RESULTS.

PROCESS AND APPARATUS PATENTED IN ALL COUNTRIES.

By this system more gas, and of a higher heating power per cubic foot, can be generated from a ton of Bituminous Slack Coal than by any other from a ton of Anthracite Coal or Coke.

The successful application of Water Gas for industrial purposes was brought about through this Process at the Works of the—

JOHN RUSSELL CUTLERY COMPANY, Turner's Falls, Mass., where it has been in daily use upwards of two years, doing all the Forging, Hardening, and Tempering.
HENRY DISSTON & SONS, Steel, Saw, and File Works, Philadelphia.
AMERICAN WALTHAM WATCH COMPANY, Waltham, Mass.
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Many other industrial establishments in America are successfully using this Process, and a large number of Works are now being erected, including a plant at Brussels and at Sheffield (at Messrs. Thomas Firth and Sons, Limited).

This process is especially adapted for firing all classes of Pottery, Tile, and Brick Kilns.

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NEWTON, CHAMBERS, & CO., LIMITED,
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SIXTY PER CENT. ECONOMY IN GAS LIGHTING.

THE SCHÜLKE REGENERATIVE LAMP

FOR DOMESTIC AND EXTERNAL LIGHTING

The only Generative Lamp employing the common flat-flame burners.

Lamps giving 20-Candle Power consume less than 4-feet of Gas per hour.

A PURE WHITE AND PERFECTLY STEADY LIGHT NOT AFFECTED BY DRAUGHTS.

Suitable for any existing fittings (brackets or suspending). Can be fixed in a few minutes.

May be seen at the Offices of the

SCHÜLKE GAS-LAMP COMPANY, LTD.,

ROOM 446—11, QUEEN VICTORIA ST., LONDON, E.C.,

WHERE PRICE LISTS AND FULL PARTICULARS MAY BE OBTAINED.

SPECIALITIES.

THE "NUGENT" RECUPERATIVE RETORT SETTINGS and FURNACES.

"ROBUS" IMPROVED RETORT SETTINGS, with COKE, TAR, and BREEZE FURNACES.

THE ABOVE SETTINGS & FURNACES ARE PROVING EMINENTLY SATISFACTORY.

Every Particular, with Estimates, forwarded upon Application to

MESSRS. J. & H. ROBUS,
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ALBO-CARBON LIGHT.

ESTABLISHED ELEVEN YEARS. Hundreds of thousands in use.

UNEQUALLED FOR BRIGHTNESS, SOFTNESS, & ECONOMY.

SINGLE LIGHTS FROM 6s UPWARDS. CLUSTERS FROM 40s. TO 145s.

SAVE half your Gas Bill. The Greatest Success of the Day.

Albo-Carbon, genuine fluted, 18s. cwt., 3d. lb.

AGENCIES GRANTED. LIBERAL TERMS.

4-Light Shop Pendant. 52s. complete.

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ENGINEERS,

NOTTINGHAM,

LONDON, MANCHESTER, AND GLASGOW.

From a Photo. of a nominal 6-h.p. Engine.

ATKINSON'S "CYCLE" PATENT

GAS-ENGINE.

The simplest and most economical Gas-Engine made.

THE BEST ENGINE FOR ELECTRIC LIGHT.

Consumes less Gas per brake horse power than any other Gas-Engine.

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R. DEMPSTER & SONS, Ltd.,

ESTABLISHED 1855.

ROSE MOUNT GAS ENGINEERING WORKS.

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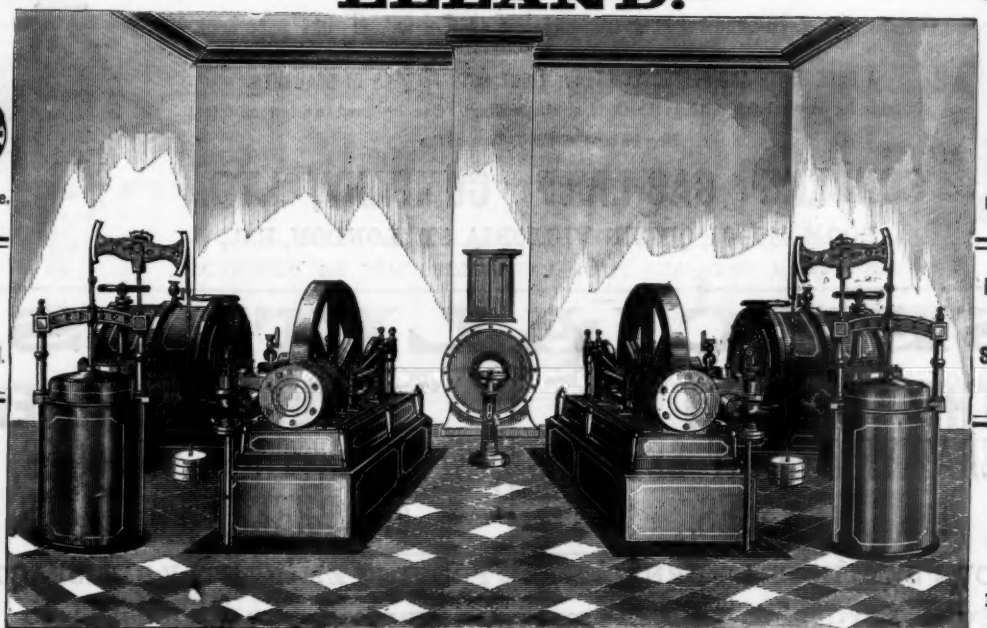
No. 1. Flange Valve.

NO SLIP.

NO OSCILLATION.

No. 3. Screw Valve.



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NO HIGH SPEED.

STEADY GAUGE.

No. 6. Disc Valve.

THE ABOVE IS AN ILLUSTRATION OF A PAIR OF THE ELLAND ROTARY EXHAUSTERS ERECTED BY US AT WIGAN, EACH OF WHICH ARE CAPABLE OF PASSING 80,000 CUBIC FEET OF GAS PER HOUR.

Makers of every other description of Gas Plant, including Retorts, Retort Mountings, Condensers, Washers, Tar and Liquor Separators, Scrubbers, Purifiers, Gasholders any size, Patent Centre-Valves, Four-Way Valves, Rack, Screw, and other Valves.

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ALDWARKE MAIN GAS COAL.

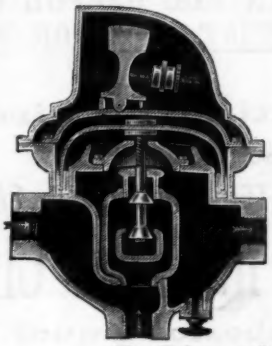
This Coal yields 12,600 feet of 16-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.

THE WENHAM AUTOMATIC

GAS GOVERNOR

As supplied to and approved of by H.M. Government.

The most reliable Automatic Method of economizing Gas without reducing the Illuminating Power.



HUNDREDS ALREADY FIXED.

FLOOR

WARMING STOVES

(LEEDS' PATENT).

CAN BE SUPPLIED FOR EITHER GAS OR OIL.

THESE STOVES ARE

CLEANLY, PORTABLE, ECONOMICAL,

And applicable for all kinds of Rooms where a Comfortable and Wholesome Atmosphere is desired.

For Prices and further Particulars, apply to the Manufacturers,

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W. C. HOLMES & CO.,

CONTRACTING GAS ENGINEERS.

SPECIALITIES.

Patent Regenerative Retort-Settings.

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Patent Reciprocating Exhauster.

Patent Regulator.

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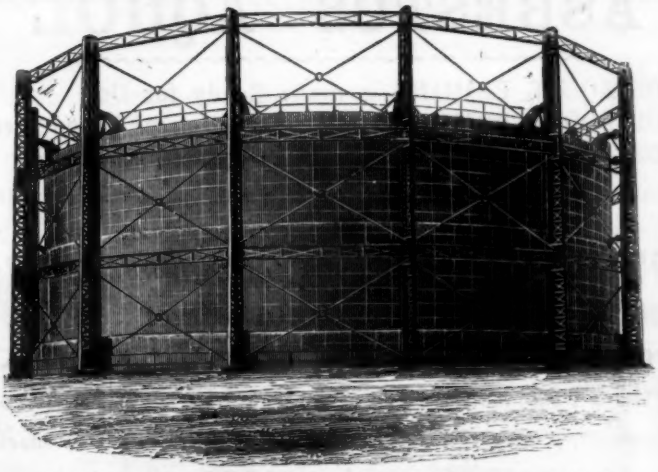

Treble-Lift Gasholder, 130 ft. by 60 ft., as erected at Burton-on-Trent.

SOLE MAKERS OF DRAKE'S PATENT

GAS PLANT

Specially adapted for Country Places, and for mixing with Coal Gas to increase Illuminating Power.

Condensers, Scrubbers, Purifiers, and all Fittings for Gas-Works.

IMPROVED CHEMICAL PLANT.

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BELL'S ASBESTOS AQUOL PAINT

IS MADE READY FOR USE.

IS FIRE RESISTING.
IS WASHABLE.
IS NON-POISONOUS.
IS MANUFACTURED IN ALL USEFUL COLOURS.
IS IMPERVIOUS TO HEAT, COLD, OR WATER.
IS WITHOUT SMELL.

No expensive Oil or Turpentine required.

WILL NEVER BLISTER.

HAS A COVERING CAPACITY **40** PER CENT. GREATER THAN LEAD PAINTS.

For Outside or Inside Work in any Climate.

Bell's Asbestos Aquol Paint is equally suitable for the finest decorative work as well as for general painting. It can be applied over or under any other paint, and, owing to its easy application, can be used with a large distemper brush; the SAVING THUS EFFECTED IN LABOUR BEING **50** PER CENT. OVER THAT OF LEAD PAINTS.

Bell's Asbestos Aquol Paint is susceptible of the most delicate treatment; and, owing to its perfect flatted surface, it brings up the varnish in a manner that no other paint can equal. ONE COAT OF VARNISH ON **Bell's Asbestos Aquol** IS EQUAL TO TWO COATS ON ORDINARY PAINT.

BELL'S ASBESTOS AQUOL PAINT is specially adapted for Private Houses, Exhibition Buildings, Ships, Churches, Asylums, School Boards, Railway Stations, and all work of Wood, Iron, Cement, Plaster, Stone, Brick, &c., &c.

Those who Study Economy and Protection from Fire should use only

BELL'S ASBESTOS AQUOL PAINT.

BELL'S ASBESTOS AQUOL PRIMING is made Ready for Use.
BELL'S ASBESTOS AQUOL PRIMING stops all suction of Wood, Cement, Plaster, &c.
BELL'S ASBESTOS AQUOL PRIMING should be applied to all New Work.

Suitable for Ceilings, Walls, and New Wood, and is very durable.

BELL'S ASBESTOS AQUOL KNOTTING, for Stopping Knots in New Work.

AN EXCELLENT CURE FOR DAMP WALLS.

Colour Cards and Price Lists on Application.

Supplied in Casks of 5 to 7 cwt., and Iron Drums of 28, 56, and 112 lbs., Sample Tins of 7 and 14 lbs.

Owing to its Covering Capacity, a SAVING IN FREIGHT of 40 per cent. is effected for a given surface.

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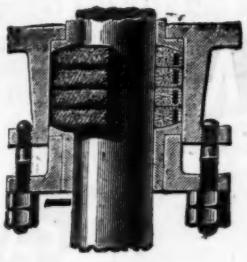
BELL'S ASBESTOS DAGGER

PACKING

PATENT No. 15,498.



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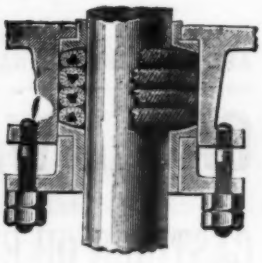

SQUARE. Every 10 feet has Label as above, and bears our Trade Mark.

Under this registered title are included the inventions of Mr. Field; and experience has proved them to be the MOST EFFICIENT DURABLE, and ECONOMICAL PACKINGS ever made. They constitute such a combination of Asbestos and India-rubber as secures the maximum of elasticity and heat resistance; and they are, therefore, UNEQUALLED FOR EVERY KIND OF ENGINE. These Packings are being universally used by most of the leading Steamship Companies throughout the world for ordinary Compound, Triple, and Quadruple Expansion Engines of the latest types. The packings are composed of rolled Asbestos Cloth, but the India-rubber is placed in two forms to suit various cases.

IN ORDERING STATE WHETHER SQUARE OR ROUND IS REQUIRED.

BELL'S ASBESTOS CO., Ld.

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LIVERPOOL: 2, Strand St., James St.
HULL: Humber Dock Basin.
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DEPÔTS.

BIRMINGHAM: 7, John Bright Street.
GLASGOW: 35, Robertson Street.
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BARCELONA, and ANTWERP.

SOUTHWARK, BELL'S ASBESTOS. LONDON, S.E.

BELL'S ASBESTOS

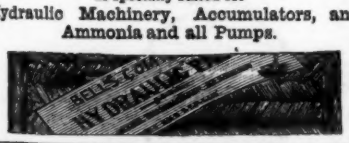
YARN AND SOAPSTONE PACKING

Is the BEST LOCOMOTIVE PACKING made.

BELL'S

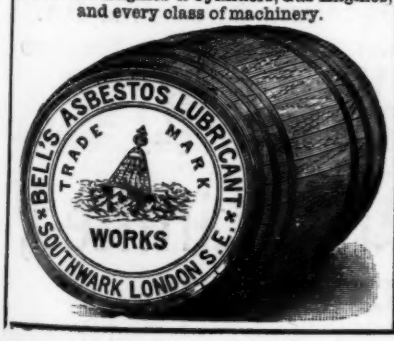
COMPOUND HYDRAULIC PACKING

Is specially suited for Hydraulic Machinery, Accumulators, and Ammonia and all Pumps.



BELL'S ASBESTOS LUBRICANT

Is unequalled
For Steam-Engines & Cylinders, Gas-Engines, and every class of machinery.



BELL'S ASBESTOLINE

The reputation of this Lubricant is based on the experience of thousands of users, which places it far in advance of those who rely only on mere laboratory tests.

ASBESTOLINE IS THE CHEAPEST MOST EFFICIENT, CLEANEST MOST INODOROUS AND SAFEST LUBRICANT.

ASBESTOLINE HAS SAVED 90 PER CENT. OVER OIL.

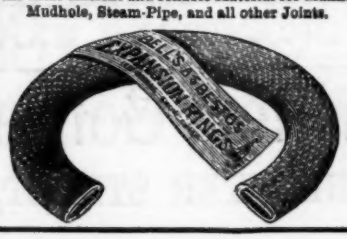
Has been used for all purposes, AND BEATEN ALL OTHER LUBRICANTS IN ACTUAL WORK.

BELL'S ASBESTOS

EXPANSION SHEETING

RINGS, AND TAPE.

Is the most efficient and reliable Material for Manhole, Mudhole, Steam-Pipe, and all other Joints.



BELL'S ASBESTOS

NON-CONDUCTING COMPOSITION.

Will reduce loss by radiation, and saves 40 per cent. of fuel.

Is suitable for boilers with flat or round bottoms. Is superior to any other, and saves its cost in a few months.

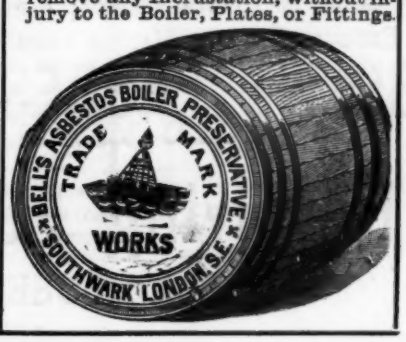
Is sent out dry in bags; therefore cheaper than others sent out wet.

ALL BAGS ARE MARKED AS ABOVE.

BELL'S ASBESTOS

BOILER PRESERVATIVE

Will effectually keep Boilers clean, and remove any Incrustation, without injury to the Boiler, Plates, or Fittings.



HORSELEY COMPANY, LTD.

TIPTON, STAFFORDSHIRE.

London Office: 6, Westminster Chambers, Victoria Street.

GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS,

AND ALL KINDS OF GAS AND WATER WORKS PLANT.

GAS AND WATER PIPES

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CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY.

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GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.

ADDRESS CHIEF OFFICES:

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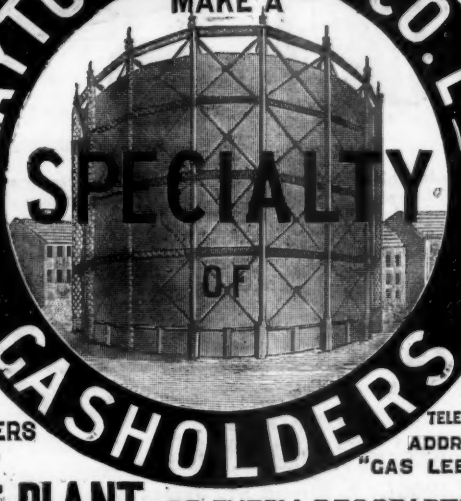
ESTABLISHED MORE THAN A QUARTER OF A CENTURY

WORKS HUNSLET, LEEDS

LONDON OFFICE: 60, QUEEN VICTORIA STREET E.C.

CLAYTON SON & CO. LTD.

MAKE A SPECIALTY OF GASHOLDERS



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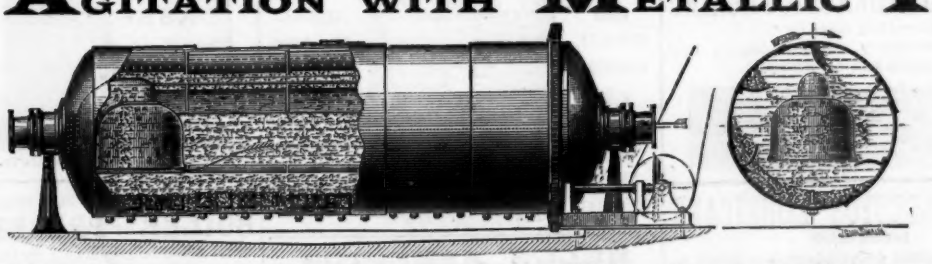
THE

REVOLVING PURIFIER

(ANDERSON'S PATENT)

For the Purification of River Water and Sewage Effluent in Large Volumes, and for Removing Colour from Water containing Peat or Clay,

BY AGITATION WITH METALLIC IRON.



MADE IN FOURTEEN SIZES; CAPABLE OF TREATING SINGLY 5000 TO 1¼ MILLION GALLONS PER DAY. REDUCES ORGANIC MATTER FROM 45 TO 90 PER CENT.; TOTALLY REMOVES MICROBES FROM POLLUTED WATER.

GOLD MEDAL, INVENTIONS EXHIBITION, 1885.

Revolving Purifier Company, Limited,

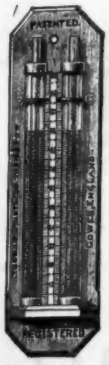
DOCK HOUSE, BILLITER STREET, LONDON, E.C.

THE ONLY

GAS PRESSURE GAUGE

EVER OFFERED HAVING NO FIXED JOINTS.

For use with Crude Gas there is nothing to equal them. They can be taken to pieces in a moment for cleaning. Sheffield has ordered 20 pairs. There are nearly 1000 feet of these Gauges already in use by the following Gas Companies:—



Ryde, Reading, Guildford, Eastbourne, Ventnor, Shanklin, Lymington, Winchester, Gosport, South Metropolitan, Southampton, Bridport, Salisbury, Aylesbury, Newtown, Guildford, Yarmouth, I.W.; Trowbridge, Ware, Abergavenny, Winslow, Ware (repeat order), Sandown, Portsmouth, Fareham, East Cowes, Felixstowe, High Wycombe, Ramsgate, Newtown (repeat order), Crystal Palace, Sedgley, Wells (Somerset), Broadstairs, Faversham, Buckingham, Portishead, Beckton, Richmond, Sittingbourne, Uxbridge, Pewsey, South Shields, Burslem, High Wycombe, Cirencester, Sunbury, Nottingham, Oldham, Wallasey, Kildwick, Hastings, Worksop, Sheffield, Merthyr Tydvil, Skipton, Chesham, Montrose, Saltash, Skipton (repeat order), Malton, Kington, Luton, Sheffield (repeat for 6 pairs), Handsworth, Guernsey, Aldershot, Sheffield (repeat order, 8 pairs), Hinton St. George, Wateringbury, Luton (repeat), Eye, Sittingbourne, Lambeth, Wells (repeat order), Pinner, Broadstairs, Hoylake, Romford, Reading (repeat order), Stone, Fenton-on-Trent, Birkenhead, Scarborough, Ryde (repeat order), Southport, Keighley, Sheffield (repeat), Accrington, Gravesend, St. Albans, Maryhill (repeat), New Barnet, Portobello, Kettering, Ilkeston (repeat), Bournemouth, Wantage (repeat for 3 pairs), Wisbech, Beverley, Barryhead, Pewsey, Auchterarder, Blaenavon, Elgin, Shanklin (repeat), Petersfield, Chipping Norton, Lupus Street (London), Halifax, Manchester, Cork, Carlisle, Dukinfield, South America, Cheltenham, Winchester (repeat), Sunbury (repeat), Croydon, Worthing, Buxton, Bow Common, T. Newbigging, Ossett (repeat for 3 pairs), Maidstone, Sunderland, Bankside, Broadstairs (repeat), Kensal Green, St. Pancras, Greenwich, Harrow, Vauxhall, Barry, Paris, Tunbridge Wells, Rochford, Fulham, Bromley, Carlisle (repeat), &c.

THOMAS'S TAR-FIRE APPARATUS, Set Complete, 27/6.

J. & W. HORTON

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NEAR BIRMINGHAM

(Established 50 Years),

PATENTEES

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OF

IMPROVED GASHOLDERS AND BOILERS

and Manufacturers of every description of

Gas Apparatus,

Cast and Wrought Iron Tanks, Purifiers, Condensers, Scrubbers, Retort-Lids, Cross-Bars and Screws, Wrought-Iron Boilers for Stationary, Portable, and Marine Engines, Sugar Pans, Coolers, Clarifiers, Punts, Boats, Bridges, Girders, Roofs, Cisterns, Oil-Tanks, Melting-Pots, Crucibles, Salt-Pans, Arch and Range Boilers, and every description of General Ironwork.

Drawings, Specifications, and Estimates supplied.

GAS COAL.

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REAL OLD SILKSTONE GAS COAL.

Address, THE STRAFFORD COLLIERIES COMPANY,

Near BARNSLEY, SOUTH YORKSHIRE.

WEST'S GAS IMPROVEMENT CO., LIMITED,

Engineers, Ironfounders, and Contractors,

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER,

MANUFACTURERS OF

WEST'S PATENTED MACHINERY FOR CHARGING AND DRAWING GAS-RETORTS.

OVER 160 MACHINES AT WORK AND IN COURSE OF CONSTRUCTION.

ADVANTAGES ATTENDING ITS USE ARE:—

INCREASED VOLUME of GAS per TON and INCREASED YIELD per Retort.—The system of breaking and distributing the coals in an even layer in the retorts effecting more perfect carbonization.

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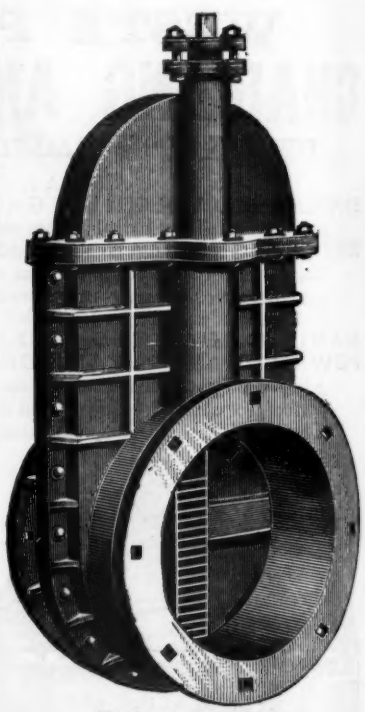

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